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KEY TO PRONUNCIATION.

ḡ	far, father	ñ	Span. ñ, as in <i>cañon</i> (căn'yôn), <i>piñon</i> (pên'yôn)
â	fate, hate	ng	mingie, singing
a or ă	at, fat	nk	bank, ink
â	air, care	ô	no, open
â	ado, sofa	o or ô	not, on
â	all, fall	ô	corn, nor
ch	choose, church	ó	atom, symbol
ē	eel, we	q	book, look
e or ě	bed, end	oi	oil, soil; also Ger. <i>eu</i> , as in <i>beutel</i>
é	her, over: also Fr. <i>e</i> , as in <i>de; eu</i> , as in <i>neuf</i> ; and <i>œu</i> , as in <i>boeuf</i> , <i>cœur</i> ; Ger. <i>ö</i> (or <i>oe</i>), as in <i>ökonomie</i> .	ō or oo	fool, rule
ę	befall, elope	ou or ow	allow, bowsprit
ē	agent, trident	s	satisfy, sauce
ff	off, trough	sh	show, sure
g	gas, get	th	thick, thin
gw	anguish, guava	th	father, thither
h	hat, hot	ū	mute, use
h or H	Ger. <i>ch</i> , as in <i>nicht, wacht</i>	u or ū	but, us
hw	what	ū	pull, put
i	file, ice	ü	between u and e, as in Fr. <i>sur</i> , Ger. <i>Müller</i>
i or I	him, it	v	of, very
l	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din	y	(consonantal) yes, young
j	gem, genius	z	pleasant, rose
kw	quaint, quite	zh	azure, pleasure
â	Fr. nasal <i>m</i> or <i>n</i> , as in <i>embonpoint</i> , <i>Jean</i> , <i>temps</i>	' (prime), " (secondary)	accents, to indicate syllabic stress

THE AMERICANA

Vivien de Saint-Martin, vè-vè-ân dé sâ-ma-r-tân, Louis, French geographer and author. b. Saint-Martin-de-Fontenoy, France, 17 May 1802; d. Paris 3 Jan. 1897. He early devoted himself to geography, his first work 'Carte Electorale' appearing in 1823. He founded and conducted in 1828-30 'Bibliomappe,' a geographical journal, and subsequently was engaged for many years in various labors of translation and editing. He was one of the founders of the Paris Geographical Society, and in 1863-76 he edited the 'Année géographique,' a post which he resigned to assume direction of the 'Nouveau Dictionnaire de géographie universelle.' His works include: 'Description de l'Asie Mineure' (2 vols. 1845); 'Etude sur la géographie grecque et latine de l'Inde' (1848-60); 'Atlas universel de géographie, moderne, ancienne, et du moyen âge' (1877), etc.

Viviparous Animals, the name given to those animals which bring forth their young alive. Properly speaking, the name should be limited to that form of reproduction seen in Mammalia alone, in which the young during the whole course of their development are contained within the parent body, and bear to the parent organism a definite and intimate degree of relationship. Thus in Mammalia the young animal is contained within a special cavity, the uterus or womb, and is nourished by the blood of the parent during its development, while only at birth does it pass from the body of the parent to the outer world. See **REPRODUCTION**.

Vivisection—Its Influence on Surgery. I have been asked by the editor of 'The Encyclopedia Americana' to write a brief resumé of the influence of vivisection on the progress of modern surgery. I shall do so as briefly as I possibly can, stating only facts which are generally well known to surgeons, but of which the general public of necessity must be ignorant to a great extent. Most of the facts below stated are known to me personally, as they have occurred during my professional lifetime; and I can, therefore, vouch for their accuracy.

If a physiologist were asked to contribute a similar paper he would be able to tell a similar story as to the revelations of the functions of various organs in the human economy obtained through vivisection; if a professor of pharmacology (that is, the action of drugs upon the living body) were to write a similar paper he would be able to show an equal debt owing to animal experimentation, first in giving us an exact knowledge of the action of drugs, and, secondly, in the introduction of a large number of new drugs. In this was cocaine was introduced into medicine and the proper use of such a powerful drug as digitalis was shown.

If a medical man were to write a similar chapter he would scarcely know where to begin. The whole life history, for example, of the *Trichina* has been studied in animals and the results applied to man, so that if every one would heed the warning no one need die from the trichina worm in pork. This has had also

an enormous commercial value, since all our hog products are exported on condition that the trichina be excluded by microscopical examination. In diphtheria the percentage of deaths has been reduced in Baltimore from about 70 per cent to about 5 per cent. The saving of human life in a single year in New York has been 1,500. All this is due to the antitoxin of diphtheria, which has been evolved almost solely as a result of animal experimentation.

Two water companies in London in 1853 experimented on 500,000 human beings, and, as a result of the cholera, one of them killed 3,476 human beings. In that same year Thiersch, in Leipsic, experimented on 56 mice. Had the lesson of these few mice been heeded the lives of these human beings might have been saved. More than that, even at the present day, as a result of Koch's discovery of the cause of cholera, Haffkine, in India, is making protective inoculations which are proving of the greatest value. By the same method we have recently discovered that the bubonic plague is spread by rats, and that efficacious vaccines can be used against this dreadful disease; that the malarial parasite and yellow fever are spread by mosquitoes, as proved by studies in birds and in human beings; and the preventive inoculations against typhoid (as yet in the early stage of their use, have been discovered by the same means.

Let me give one illustration of the method by which the cause of one disease—tuberculosis—was proved. Similar methods are employed in tracing the causes of others. In a case of consumption of the lungs the expectoration is examined by the microscope after applying a staining material. Without staining the tubercle bacilli are so translucent (like little rods of jelly) that we can scarcely see them. Having found this peculiar germ in the expectoration, some of the material is injected under the skin of a guinea pig or mouse. After a certain time the animal either dies or is killed, and a post-mortem examination is made. If there are found in the body of the guinea pig little nodules—that is, tubercles (little tubers)—these are examined by the same method and the same germs will be discovered and can be obtained in a pure culture. But the circle of proof is not yet complete. A small portion of this pure culture of the germs obtained from the inoculated animal is again injected into another animal, and if the second animal suffer from a similar disease and the same germ be found again, the conclusion is irresistible that the cause of the tuberculosis is the peculiar germ always found in such cases.

I well remember the incredulity with which I first read of the origin of lockjaw from the soil, but very soon this incredulity was changed to belief in the face of absolute demonstration after this fashion: It had been well known for years that hostlers, cavalymen, farmers, and persons who were engaged in any occupation about horses were peculiarly liable to lockjaw. After the discovery of the bacillus of lockjaw in 1884, by Nicolaier, when a case of lockjaw occurred, the ground on which the patient had fallen, or the instrument by which he had been

VIVISECTION

hurt, was examined, and a certain bacillus was found in or on it. This was inoculated into animals, and was found to produce the same disorder; and the same bacillus was recovered from the animal's body, was re-inoculated, and reproduced the disease. The circle of proof, therefore, was complete. This explained the popular belief that treading on a rusty nail is a frequent cause of lockjaw; not because it was a nail or old or rusty, but because the germ of lockjaw was on it and in the ground in which it was lying. No such exact experiments are justifiable on man. The sacrifice of a few rats quickly gave us all the desired information. This has abolished lockjaw as a result of surgical operations, and enabled us to cure it in many cases even after accidental inoculation. Before 1884 it was both frequent and fatal; now it is almost a surgical curiosity, except after neglected accidents.

The two most important surgical discoveries of the 19th century were, (1) anesthesia, especially by ether (in 1846) and by chloroform (in 1847); and (2) antiseptics, by Lord Lister, who began his work soon after the middle of the 19th century and had distinctly formulated it about the end of the '60s. His remarkable paper in 'The Lancet' of 3 April 1869 (when he was simply Mr. Lister, professor of surgery in the University of Glasgow), was one of those papers which marked a new era in surgery. Several years before he had announced that he believed that inflammation and most of our surgical disorders were due to germs, and that if we could exclude these germs we would be able to secure the healing of wounds without inflammation and without the formation of pus (matter); yet it was not until 1881 that Ogston and Rosenbach discovered the germs which produce the terrible results of inflammation, such as erysipelas, hospital gangrene (what irony in the name!), abscesses, blood poisoning and even death.

Hemorrhage.—One of the most important contributions by Lister to the progress of surgery was the introduction of antiseptic threads (ligatures) of catgut, with which to tie blood-vessels. An early Philadelphia surgeon, Philip Syng Physick, tried to get rid of the dangers following silk, which had been used to tie arteries ever since Ambroise Paré introduced it in the 16th century as a happy substitute for the horrible hot pitch and hot iron which then were the only means for arresting hemorrhage. Physick sought to use buck-skin, on the ground that it was an animal substance and would, therefore, disappear by absorption. Dorsey used catgut. Hartshorne used parchment cut in fine threads, and Bellinger and Eve the tendon of the deer. But none of these surgeons succeeded in giving us harmless ligatures until Lister taught us how to use them. In the paper to which I have referred he showed that the old idea of a ligature was that it was a foreign body which was ultimately to be got rid of by its rotting through the walls of the blood-vessel. The result was that in a very large percentage of cases the blood-vessel was not stopped by a clot; secondary hemorrhage took place (usually during the second week after an operation), and many a patient bled to death.

I shall never forget one night in the Satterlee Hospital in West Philadelphia, about 30 days

after the battle of Gettysburg, when I was called five times to check just such secondary hemorrhage from the rotting through of silk ligatures. As a consequence of the introduction of antiseptic ligatures by Lister I do not recall in the last 20 years five cases similar to these five that I then attended in one night. In other words, secondary hemorrhage has almost disappeared from surgical experience.

How did Lister find out the proper method of tying an artery? On 12 Dec. 1867, he tied the great carotid artery in the neck of a horse with a piece of pure silk saturated with a strong watery solution of carbolic acid, cutting both ends of the thread short and dressing the wound antiseptically. Healing took place without any inflammation. Six weeks after the operation he investigated the parts by dissection, and found that if the thread had not been applied with the antiseptic precautions secondary hemorrhage would unquestionably have occurred, and in all probability the animal would have bled to death. On 29 Jan. 1868 he applied this principle in the case of a woman of 51 with an enormously dilated sac (an aneurysm) in the upper part of the great artery supplying the thigh and leg. She, like the horse, recovered without inflammation, and lived for 10 months. On 30 November she suddenly died as the result of a rupture of a similar dilatation of the aorta in the chest. This gave Lister the unusual opportunity of examining in a human body the result of his application of an antiseptic thread to the arteries. The case emphasizes one of the great difficulties in studying such questions on human beings. The opportunity for a post-mortem examination after such an application of a new principle can only be occasional. If this woman at the time of her death had been under the care of some other surgeon than Lister no such careful examination of the consequences of the tying of the artery would have been made, and no further progress would have followed. The result of his examination showed that in spite of his care an incipient abscess was developing at the point at which he had tied the artery. This was in consequence of the presence of the thread, and especially of the knot.

As a result of this investigation, on 31 Dec. 1868 he tied the carotid artery in the neck of a calf with catgut which had been prepared with carbolic acid, and all antiseptic precautions were used during the operation. The calf recovered perfectly, and in 30 days was killed and the parts dissected. He found that at the site of the thread of catgut, replacing the thread, there was a band of living tissue which closed the artery, and that, therefore, instead of the thread rotting through, as was the case with the silk, it had become a part and parcel of the tissue. The artery, instead of being so weakened as to allow of secondary hemorrhage, was really stronger at this point than at other points. The ligature and the knot had entirely disappeared.

I have narrated this somewhat in detail for this reason: It illustrates admirably the method of scientific progress by experiment upon animals. Neither of these animals suffered any material pain, both operations having been done with the same antiseptic care as in a human being. Both of them were killed at such a time as would facilitate our knowledge of the results.

VIVISECTION

Since then other experimenters have tied the blood-vessels in animals and have killed them at varying intervals and made microscopical examinations of the blood-vessels. In this manner our knowledge of the way in which hemorrhage is stopped is now complete. The knowledge which was attained within a short time by the sacrifice of a few animals would have been attained only after many years by occasional post-mortems, and would then have been very much less perfectly attained and by the loss of many human lives instead of a few animals' lives.

Contrast, now, the result of the old and the new surgery in the mere matter of stopping hemorrhage after operations or accident by tying blood-vessels with the old ordinary silk and the modern antiseptic catgut, or with silk itself as now used by improved methods. In the old way the blood-vessels were tied with silk, which was as clean as an ordinary housewife would have it. One end was left long, and it was no uncommon thing after an amputation of the thigh to have as many as 20 or 30 of these ligatures or threads hanging out of the wound. After two or three days, when those on the smaller blood-vessels would possibly be rotted through, each ligature was pulled upon, and those that were already loosened by putrefaction came away. Finally, at the end of 10 days, two weeks, or three weeks, the ligature on the great blood-vessel of the arm or the thigh came away, not uncommonly followed, as has been stated, by profuse and often fatal hemorrhage. Sometimes, as in Lord Nelson's case, such a ligature did not rot away for years, and required dressing of the arm all of this time on account of the constant discharge.

What happens to-day in a surgical operation where either properly prepared silk or catgut is used? We tie all the blood-vessels needing it, cut off both ends of the threads short and close the wound entirely; and, instead of having discharge and horrible inflammation for days and often weeks and sometimes months, it is now a rare thing for such a wound not to be entirely healed within 10 days, and sometimes less, and secondary hemorrhage is almost unheard of. If vivisection had given to surgery only the modern means of stopping hemorrhage it would be worth all the labor it has required and all the suffering it has inflicted on all the animals ever experimented upon.

Of late a new problem in hemorrhage has been presented. When an artery is wounded—as, for instance, if the blade of a pocket knife has been thrust into the thigh and wounds the great femoral artery—the only way to prevent the patient's bleeding to death has been to expose the artery and tie it above and below the point where it was cut. Of late several surgeons (especially Murphy, of Chicago) have made some very ingenious experiments on such wounded blood-vessels. They have carefully exposed the artery of an animal (under an anesthetic, of course), have wounded it, and then, instead of tying the artery, have sewed up the wound in the wall of the artery to see whether this could not be done successfully. The reason for this series of experiments is this: When we cut off the supply of blood to a leg or an arm by tying the blood-vessel, gangrene not uncommonly occurs, because the chief blood supply of the limb is cut off by

tying the artery. If instead of tying the vessel we can sew up the wall and it will heal, the current of blood is uninterrupted and there is no danger of gangrene. Matas of New Orleans has cured even aneurysms by sewing up the walls of the arteries in a similar manner—a great recent advance in the treatment of this often fatal disease. One thing is perfectly manifest—it would never be proper to make such experiments on human beings. Human life would be endangered, and no surgeon would adopt or would be justified in adopting such a novel procedure until it had been tried and proved successful on animals. Several successful cases of suture (sewing) of the large blood-vessels have now been done in man.

The Brain.—When I first taught anatomy, 38 years ago, the various portions of the brain were not supposed to have separate functions. We knew, of course, that disease or an injury on one side of the head produced paralysis on the opposite side of the body. Broca also discovered by observations on man in actual cases of disease that when that part of the brain corresponding to the left temple was affected the power of speech was lost. But if a man had a fracture of the skull or a gunshot wound in the region above the ear or in the front of the brain or the back of the brain, there was no well recognized difference in the results. This was largely due to the fact that such injuries are widespread, and not limited to small areas. In Germany Fritsch, Hitzig, and Goltz, and in England Horsley, Ferrier, Schaeffer, and others, pursued the following plan: The monkey's brain is the nearest in similarity to man's. A known portion of the brain—for instance, the region above the ear—being exposed, the brain was mapped out in small squares and each one of these squares in succession had the pole of a battery applied to it. The phenomena which occurred—whether opening and shutting the eyes, turning the head right or left, contraction of the muscles of the arm or leg—were all carefully noted down. In this way a distinct map of the brain was made, so that now we know definitely that a certain area of the surface of the brain governs the movements of the eyes, of the head, of the arm, forearm, hand, thumb, thigh, leg, great toe, etc. In the same way at the back of the head the area which governs sight has been found, and it was discovered that the area on the right side if destroyed made the right half of each eye blind, and that if the area of the left side was destroyed the left half of each eye became blind. This description is, probably, sufficient to indicate how physiologists and surgeons have investigated the brain.

The following is an instance which shows how accurately this method has enabled us to locate the motor centres in the brain: A girl who suffered from epilepsy and in whom the convulsions always began in the right thumb, and then spread to the arm and the body, was operated upon. A piece of the gray matter of the brain, as large as the last joint of the forefinger, was removed from the place determined upon animals as the centre governing the movements of this thumb. When she awoke from the ether every muscle moving the thumb was entirely paralyzed, and no other muscle in the body. When we remember that the muscles which move the thumb arise in the

VIVISECTION

ball of the thumb, between the thumb and the forefinger and on the front and the back of the forearm nearly as high as the elbow, this is seen to be most remarkable. I do not know a single case ever recorded of so minutely located disease. By no other means than vivisection could this small thumb centre have been determined. She entirely recovered from the paralysis, and her epileptic fits instead of being almost daily were reduced to one or at the most two a year. This has made possible the modern surgery of the brain, which would not exist to-day were it not for vivisection.

Here and there an unexpected post-mortem examination, as in the case of Lister's woman patient, has given us some special information, but nine tenths if not ninety-nine one-hundredths of our knowledge of cerebral localization is the result of exact experiment on animals. As a consequence of this in 1884, for the first time in the history of surgery, the existence of a tumor of the brain, which was not indicated by anything on the outside of the head, was diagnosed, its location determined, and the tumor removed. When the skull was opened no tumor was visible; but so confident was Mr. Godlee, the surgeon, that he cut boldly into the substance of the brain and there found the tumor which had been so accurately diagnosed. Since then this first achievement has been repeated not only scores, but hundreds of times, and the net result up to 1899 was that 491 brain tumors had been operated on. In 64 palliative operations for the relief of headache, blindness, etc., the mortality was only 15.6 per cent. In 275 completed operation, 82 died, a mortality of 30 per cent. In 43 cases in which the tumor could not be removed, 20 died, a mortality of 67.5 per cent. In 109 cases in which the tumor was not found, 57 died a mortality of 52 per cent. This localization of cerebral functions, together with antiseptics, has so revolutionized (or, rather, created) modern cerebral surgery that the principal facts are a matter of common knowledge. Tumors are now attacked not only in what is called the motor area (that is, that portion of the brain governing movement, which, roughly speaking, may be described as lying above the ear), but many times in the front part of the brain, and at the back of the brain, far outside of the motor area. In case the tumor is at the base of the brain, or at certain other parts this knowledge has prevented useless operations which otherwise might have been performed.

It is a source of sincere gratification on the part of numerous surgeons that by this same knowledge of cerebral localization derived from animal experimentation they have been able to recognize hemorrhage inside the skull, open the skull at the right point, even when there was no fracture, and save their patients. Before experiments on animals showed us how to interpret the symptoms this was an impossibility, and nearly all such patients died. Now we save, roughly speaking, two out of three.

Time and space would fail me to tell of the abscesses of the brain, of the foreign bodies in the brain (such as nails driven into it by accident or design, rifle balls which had lodged in it) and of many other similar surgical disorders the modern successful treatment of which depends directly upon the localization of cerebral

functions, which is the result almost wholly of experiments upon animals.

The Spinal Cord.—Up to the present time the belief of surgeons has been that in case the spinal cord was completely cut in two, either by gunshot wounds, fracture of the spine or otherwise, no reunion of the two ends would take place, and, therefore, there was no possibility of relief for the paralysis below the point of division of the cord which is almost always fatal. Very recently, at the Pennsylvania Hospital, Dr. Francis T. Stewart had a patient whose spinal cord was cut in two by a bullet. He removed the bone sufficiently to get access to the spinal cord, and found it completely divided. He immediately stitched the two ends together, and, strange to say, this patient has recovered both feeling and motion to some extent in both legs. Since his case two or three other similar cases of recovery of sensation and motion have been reported. I think it would be evident to any person that such a totally unexpected result deserves the most careful investigation. In man cases of such complete division followed by recovery are almost unknown; and if they had to be studied in man this would be imperfectly done, and probably would require 15 or 20 years before we would know what ought to be done. It is one of those cases in which it is our duty to investigate by experiments upon animals what is the best method of sewing the two ends of the spinal cord together; at what date after division of the cord it will be hopeless to do so; how much of the cord can be lost (that is to say, a half inch, inch, or more) and yet by stitching the two ends together it will be possible to restore the function of the spinal cord. One can see very readily that in animals all these problems can be studied minutely, in a sufficient number of cases; various procedures can be tested and the results determined accurately by killing such animals at a suitable date, and a definite conclusion can be reached in a short time.

In 1888 Mr. Horsley, the distinguished London surgeon, and Dr. Gowers, equally distinguished as a neurologist, for the first time in the history of surgery made a diagnosis of a tumor of the spinal cord, definitely located it and the former removed it, the patient making an absolute recovery. A number of other cases have been successfully operated on since then. Just as in the case of tumors of the brain, this would not have been possible had it not been for experiments upon animals, which have given us practically most of our present knowledge of the minute anatomy and physiology of the spinal cord and have, therefore, enabled us to deal with it surgically.

Nerves.—Among the most fruitful branches of research which have been so valuable in results are the animal experiments upon the different nerves of the body. The methods by which nerves could be sewed together; the possibility of taking a portion of a nerve or even of the spinal cord from a rabbit or other animal to replace a piece of the nerve when it has been destroyed by accident or disease; the possibility of sewing one nerve to a neighboring nerve in order to re-establish its function—all of these and other similar operations have been studied in animals, and could only be studied in animals with exactness.

VIVISECTION

In order to study such conditions it is not enough that the two ends of the nerve should be sewed together and then, after the wound was healed, that we should simply determine the fact that the functions of the nerve are re-established. It is necessary to know by the microscope the various steps of the process of union of the nerves—to investigate various methods of sewing them together; whether they can be overlapped, or must be applied exactly end to end; whether one end of the nerve can be split and the other inserted into it, or turned over as a flap, and so on. Evidently numerous methods can only be studied on animals. Then, when the results are known, we can apply them for the benefit of man.

The Thyroid Gland—One of the commonest diseases in Europe, and one that is occasionally seen here, is goitre. This forms a large tumor in the neck, for which formerly little could be done, as operation was nearly always fatal. Such patients were obliged to go through life with a dreadful deformity, in the greatest discomfort, and were sometimes suffocated by pressure on the windpipe. In consequence of the introduction of the antiseptic method of Lister, which we owe to vivisection more than to any other agency, operations on the thyroid gland are now so common that at the German Surgical Congress Professor Kocher, of Bern, has reported 2,000 operations done by himself, with a mortality of only 4 per cent.

Very soon it was discovered that removal of the entire gland produced a curious effect. The face became bloated; the expression greatly changed, and the patient became more or less idiotic—that is, the condition known as myxedema followed. This led to improvement in operations in several directions. First, in all those cases in which the tumor could be shelled out, as an English walnut is turned out of its shell, leaving a portion of gland tissue behind, this was done. The similar effects of the removal of the thyroid in animals were studied especially by Mr. Horsley. Surgeons then removed the thyroid gland from the neck of an animal and placed it under the skin of the same animal, and it was found that the disastrous results were avoided. After a number of experiments on animals there was good reason to believe that the disastrous effects of the operation which sometimes followed goitre could be avoided in man by the same procedure. Accordingly after removal of a goitre (that is, the enlarged thyroid gland in man) the thyroid gland of a sheep was transplanted in a number of instances under the skin, or in some cases into the abdominal cavity of the patient. In both cases there was improvement for a time; but eventually the majority of the cases suffered from cretinism or from myxedema, which may be described as a less severe form of the same disease. Finally in animals a study was made to determine how much of the gland must be left in order to prevent myxedema, and now we are able to relieve patients from goitre and yet, by leaving enough of the gland, prevent any bad results following the operation.

These results led also to a careful study of the effects of giving an extract of the thyroid gland to human beings. Some of the most brilliant results that have ever been obtained in medicine have followed the administration

of the thyroid extract to cretins in whom the disease had not been produced by operations for goitre, but arose naturally. In certain forms of goitre it has enabled us to relieve or even to cure without operation. In insanity and many other mental states it is used as a well established remedy, which in even a large percentage of cases is followed by great benefit and often by cure. In many other diseases also the thyroid extract has been used with the best results.

The Larynx.—Cancer of the larynx, or that part of the windpipe back of and just below the Adam's apple, is not at all uncommon. The only hope of such patients is in removing the entire larynx or voice box. Before attempting this for the first time on man Billroth, of Vienna, and his assistant, Czerny, now the distinguished professor of surgery at Heidelberg, tested the operation on several dogs. Billroth then removed the larynx from his patient and saved his life. This operation has now been successfully repeated scores and scores of times as a result of these few experiments on dogs.

The Lungs.—A beginning has been made in the surgery of the lungs, but as yet we have not reached the point where we can say that we have attained entire success. In a number of animals parts of the lungs have been cut out with a view of discovering the possibility of cutting out diseased portions of lung, the seat of tumors, consumption, and other disorders, and a few operations have been done upon man, with a fair percentage of success. Not uncommonly abscesses of the lungs which were perfectly inaccessible a few years ago have been reached and opened. Sometimes coins and other foreign bodies get into the bronchial tubes, and can only be reached through most difficult and dangerous operations. Several surgeons have experimented upon animals to determine the safest method of removing such bodies, but with only partial success. Is it not evidently our duty to devise new operative procedures and test them on animals first, and when a reasonably promising one has been found, to apply it to man?

The Liver.—In 1890 Ponfick, of Germany, showed that in rabbits the removal of a quarter of the liver caused a slight deterioration in the condition of the animal; removal of one half was followed by much more serious symptoms, which, however, passed off within a few days. Even removal of three fourths of the whole liver could be recovered from, but removal of more than this was always fatal. By killing the animal in which a small part had been removed at a suitable time, and studying microscopically the liver tissue at different periods of time after operation—a procedure manifestly only possible in animals—he showed that there was a reparative power in the liver, which before then was unknown.

Up to that date less than a dozen surgeons had operated on tumors of the liver. In only two of them was any considerable portion of the liver removed. After the paper by Ponfick, which showed how much could be removed, surgeons immediately operated with much more confidence, and removed considerable portions of the liver. Up to 1899, 76 tumors of the liver had been removed. Of these cases the termination of two was unknown; of the remaining 74,

VIVISECTION

63 recovered and 11 died—a mortality of less than 15 per cent. One who is not a surgeon can scarcely appreciate how differently the operation for tumor of the liver was regarded before and after Ponfick's experiments. Before that everything was marked by timidity; after that everything was marked by confidence, and all to the benefit of the patient.

The Spleen.—The same story that has been told of the liver can be told of the spleen, though with much less good results. As a result of studies, partly by accident, in man (as when in consequence of a stab-wound or other injury a spleen would protrude through the wall of the abdomen, and would have to be removed), but chiefly as a result of the careful studies of removal of the spleen in animals, beginning practically with Schindler's experiments in 1870, we are now in a position definitely to say that in man the whole of the spleen can be removed, and he can not only survive the operation, but get along comfortably without any spleen. A very considerable number of such operations have now been successfully performed.

The Kidney.—On 2 Aug. 1869 Professor Simon, of Heidelberg, laid the foundation of the modern surgery of the kidney by removing a healthy kidney from a healthy woman. The reason for it was that in removing an ovarian tumor some time before he had been obliged to remove a part of the ureter (the tube leading from the kidney to the bladder), and to fasten the cut end to the skin. As a consequence of this the woman was in a most deplorable condition from the continual escape of urine over her person. After a number of unsuccessful attempts to close this external opening, it finally occurred to him that the only way to cure her was to remove the kidney on that side. Whether a human being would recover and could live with only one kidney was practically unknown. It is true that disease had destroyed one kidney in some patients and the other had gradually developed ability to do the work of both. Injury also had destroyed parts or all of one kidney; but deliberately to take out a healthy kidney from a healthy human being was an operation not only fraught with danger, but one before which all the surgical world up to that time had recoiled. No one had studied the effect on the remaining kidney and upon the heart. No one had carefully determined what was the best method of reaching the kidney—whether through the abdomen or through the loin from the back; what to do with adhesions and many other technical questions. All these had to be settled. Accordingly he experimented on a number of dogs; decided that from these indications a human being could live with only one kidney; studied on the cadaver the best way of doing the operation, and on 2 Aug. 1869, removed this healthy kidney through the loin and saved the patient's life and made her perfectly comfortable. She died in 1877, after eight years of healthy life.

As I have said these new experiments laid the foundation of the modern surgery of the kidney have been opened; scores of stones have removed successfully. Finding this operation so feasible, surgeons were led to practise other operations; some hundreds of abscesses in the kidney have been opened; scores of stones have

been removed from the kidneys; floating (that is, loose) kidney has been sewed fast in hundreds of cases; many cases of tuberculosis of the kidney have been relieved or cured; tumors of the kidney are successfully attacked; even the cut ureter has been spliced and stones removed from it. In a word, Simon's experiments on a few dogs opened to us a new domain in surgery which until then was wholly unknown. Would it not be gross cruelty to man to prevent such beneficent researches?

The Stomach.—Until 1875 practically there was no surgery of the stomach. As occasional Cæsarcan sections have been done in the past, so occasional operations on the stomach were done when the surgeon was obliged to do them. Now, however, it is a matter of routine procedure, to the vast benefit of the human race. Had vivisection contributed nothing else to the progress of surgery than its services in the surgery of the stomach, this alone would be sufficient to justify it. I may quote from the Cartwright lectures* which I gave before the College of Physicians and Surgeons in New York in 1898:

"In 1875 Tschertneisky-Barischewsky cut out a piece of the intestines in 35 dogs, with 29 recoveries—a startling result when compared with the former fatality of such operations. This was the starting point in the new gastrointestinal surgery. The next year Gussenbauer and Winiwarter cut out a piece of the stomach in only seven dogs. We scarcely can appreciate at this day, though these experiments are so recent, how many new questions had to be answered. After their first unsuccessful experiment they naively remark that certain facts were established by the experiment, among them, 'that the surfaces of the stomach have a real tendency toward union by first intention, . . . just as do wounds of the skin.' (1) Whether this would be correct of man as well as of animals they admitted was as yet uncertain. Another point settled by the experiment was 'that there was no digestion of the mucous membrane in the neighborhood of the wound.' Their second experiment was followed by recovery, and showed not only that such an operation could be successfully done, but that the narrowing caused by the scar did not interfere with the functions of the stomach, either as to its movement or its secretion of the digestive juices, and that the removal of the pylorus was not followed either by the too early escape of the food into the intestines; or by the reflux of the intestinal contents into the stomach. The dog was killed five months later and the post-mortem showed no contraction by reason of the scar, and no digestion of the edges, and his perfect health after the operation showed that the movements of the stomach and its digestive functions had not been interfered with. Then, again, the question whether catgut or other suture material was the best, and what kind of a knot and what kind of a suture would best answer were subjects of debate. . . .

"Our anti-vivisection friends, who so often declare that experiments upon animals have never contributed anything to the progress of surgical science, may well be challenged to account for the remarkable progress in the surgery of the stomach which immediately followed these

* In quoting this I have popularised some of the medical terms there used.

VIVISECTION

fruitful experiments. The dogs that died did not die in vain. They showed the correct methods and indicated errors in technic, and directly led up to the modern surgery of the stomach and the intestine in man, as follows: In the very same year, 1876, Hueter cut out a part of the bowel, though without success. In 1877 Czerny for the first time sewed up the intestine and dropped it into the abdominal cavity, with recovery; followed almost immediately by Billroth, who did the first successful suture of the stomach and total removal of a portion of the bowel. In 1878 Forelli operated for a wound of the stomach, and in 1879 Cavazzani removed a portion of the stomach for tumor. In the same year Péan did the first removal of the pylorus. In 1880 Rydygier did the second, and in 1881 Billroth did the third and first successful one, without a knowledge of the preceding operations.²

Then followed various operations on the stomach to which I will allude later, and finally the successful removal of the entire stomach. It is quite impossible to give the details of all the various operations now done on the stomach and indicate minutely the part that vivisection has had in developing this extraordinarily successful branch of modern surgery. Suffice it to say that among them are the following, all of which owe more to vivisection experiments than to any other single agency:

In cancer of the oesophagus, or in the constriction of the oesophagus which so often follows the accidental or intentional swallowing of lye or acids, etc., so that no food can get into the stomach, we now open the abdomen, open the stomach, introduce a tube or construct a passageway into the stomach, and feed the patient through this outside oesophagus, as it were. In case the narrowing of the oesophagus is not from cancer the patient can live his natural span of life. In case of cancer his remaining days are rendered relatively comfortable, since the operation prevents his starving to death. When we have cancer at the opposite end of the stomach (the pylorus), so that the food, though it can be swallowed, cannot get out of the stomach, one of two courses is followed, both of which have been carefully studied in the lower animals and then adapted to man. First, the portion of the stomach and bowel involved in the cancer is cut out and the bowel united to the stomach directly, or, in other cases, an opening is made in the stomach and one in the bowel lower down, and the two openings are sewed together, thus allowing the food to pass from the stomach directly into the bowel beyond the cancer. The mere question of how the stomach and bowel shall be most successfully united in these cases, particularly the best method to prevent fatal leakage, has required very many series of experiments, especially in this country, by Serni, Abbe, Brockaw, Ashton, Murphy, and others. As a result of their labors sometimes we have learned how *not* to do the operation because of unexpected difficulties; sometimes how to better our procedure, until now we are in possession of satisfactory methods, as has been proved by the successful operation on man many times over. Even the sewing together of the stomach and bowel alone had been done up to 1898 in 550 cases which

have been published. I have no doubt that since then this number has almost been doubled. The mortality of this operation from 1881 to 1885 was 65.71 per cent; from 1886-1890, the mortality had fallen to 46.47 per cent; from 1891 it had again fallen to 33.91 per cent, and recently in 27 cases an Italian surgeon (Carle) has had a mortality of only 7.4 per cent.

Moreover, the experiments on animals having shown how safe various operations are, have emboldened us to enlarge the sphere of our operations and do others that were before not dreamed of—a good instance of the partly indirect good results from vivisection. A brief enumeration of some of the various operations done upon the stomach, together with their mortality, is as follows:

1. Where the stomach is bound down by adhesions (which often produce the most serious digestive disturbances, destroying comfort and even threatening life), we now open the abdomen, cut or tear the adhesions, and practically all of the patients recover.

2. Where there are foreign bodies in the stomach (or in some cases foreign bodies that have stuck in the oesophagus low down near the stomach), we open the stomach, remove the foreign body (often inserting the arm to reach it in the oesophagus), sew up the stomach and the abdominal wall, and the patients generally recover. In some cases as many as 198 staples, buttons, screws, horseshoe nails, etc., weighing over a pound and a half, have been removed, and the patients have recovered.

3. Where the oesophagus has been narrowed by the swallowing of lye, etc., instead of making a permanent opening in the stomach (as before described), sometimes by having the patient swallow a perforated shot which will carry a string down into the stomach, we can open the stomach temporarily, seize and draw out the shot, attach a conical dilator to the string, and, after having dilated the constriction of the oesophagus, remove the string, sew up the stomach and the abdominal wall and cure the patient permanently.

4. We now open the stomach purely to explore it and find out whether or not there is serious disease. This has enabled us in many cases to relieve illness which otherwise was incurable. Nearly all of these patients recover from the operation.

5. The permanent opening in the stomach through which we can feed a patient I have already described. It was first proposed in 1837. It was first done in 1849. From then until 1875 28 cases were operated on, with 28 deaths! It seemed almost as though the operation must be abandoned when, in 1875, the first operative recovery occurred. From then until 1884, in 163 cases there were 133 deaths—a mortality of 81.66 per cent. At the present time the mortality is only about 25 per cent in cases of cancer, and in the non-cancerous cases not over 10 per cent.

6. As I have indicated, in certain conditions we make an opening in the stomach and another in the bowel and sew the two together. In some cases of ulcer of the stomach, which cannot be cured by medical means, this gives wonderful results, both as to comfort and cure. The operation was first done in 1881, with a mortality

decreasing from 65.71 to 33.91 per cent in general, and in the statistics of single surgeons to only 7.4 per cent.

7. The first removal of the pylorus followed by uniting the bowel and the stomach was done in 1879. The mortality was very great, and still is large, ranging from 27.2 per cent in simple cases to 72.7 per cent when there are extensive adhesions.

8. When the pylorus is simply narrowed, but is not the seat of cancer, we make an incision in its long axis, seize the edges of the incision at the middle, draw them out at right angles to the line of the incision, and by sewing them in this position we widen the opening of the pylorus. This was first done in 1886. Up to 1894 the mortality was 20.7 per cent. Recently Carle has reported 14 cases, with a mortality of only 7 per cent.

9. In not a few disorders the stomach is dilated to nearly two or three times its normal size. In these cases we now take a "tuck" in it, as was first done in 1891. In 15 such operations only one death had occurred.

10. When the stomach, instead of being dilated, is displaced, we sew it fast, and practically in all cases recovery follows.

11. Sometimes the stomach is divided into two parts, like a dumb-bell with a very short handle. The first operation for relieving this condition was done in 1893 by making an opening in each half of the stomach and sewing the two openings together. Over 40 operations have been done for this condition, with only nine deaths.

12. Tumors of the stomach other than cancer are rare, but since 1887 at least seven cases of tumor have been cut out, of which six have recovered.

13. Partial removal of the stomach finally led to its complete removal, of which over a dozen instances have been reported, with a recovery of somewhat more than half. Nearly all, however, have died from recurrence.

Some of the above operations are not the direct result of experiment upon animals (as, for instance the taking of a tuck in the stomach); but they are the indirect result, first, through the antiseptic method, which itself is the child of vivisection, and, secondly, because through our experience in other operations we have been led to perform totally new ones. It is the same in other sciences. If we were still dependent upon the old "air-pump" worked by hand we should have no lighting by the incandescent bulb of to-day, for this is dependent upon a cheap method of making an almost complete vacuum. This is a wholly unexpected and indirect result of improvement in air-pumps as one of the chief factors of progress.

The Intestines.—Very much the same story can be told of the surgery of the bowel. Indeed, the surgery of the stomach involves largely that of the bowel. I need, therefore, only recall a very few points. When a tumor or cancer exists in the bowel, of course, in a little while it obstructs the passage of the intestinal contents; and if this obstruction becomes complete and is not quickly removed the patient must necessarily die. As a result of many experiments upon animals (more especially by Senn, Parkes, and other American surgeons) we now know how

to deal with this condition. First, if the tumor or cancer can be removed it is cut out entirely, and the two ends of the bowel are united. Our present successful means of uniting them are a result of most laborious researches by experimentation upon animals to discover the best method of doing this otherwise perilous operation. The slightest leakage of intestinal contents produces a fatal peritonitis. Where the cancer cannot be removed, in order to prolong the patient's life and lessen his terrible pangs we make an opening above the obstruction and another one below and sew the two openings together. Here again many experiments were needed to determine whether an animal could live with the intestinal contents thus "side-tracked," and, if life could be maintained, what was the best method of doing the operation.

In gunshot wounds of the intestines, which formerly were among the most fatal of all accidents, we now can rescue a very large percentage of the patients. During the Civil War practically almost every case of perforation of the intestine by gunshot died. To see whether something could not be done to remedy this frightful mortality Gross many years ago performed some experiments to determine the best treatment of such wounds. Later Parkes etherized a number of dogs, shot them, opened the abdomen and treated the wounds in various ways; and in consequence of this and other series of experiments, at the present time many instances of recovery have been reported in which multiple wounds even to the number of 17 have been found, closed by methods determined by vivisection to be the best, and the patients have recovered. To reach this result it had to be determined by accurate observation on animals what was the best method of closing such wounds; what material is the best for use as a thread; under what conditions it would be needful, instead of closing the wound, to cut out the injured portion of the bowel and unite the two ends; how long after perforation occurred was the best time to operate, and many other such questions too technical to mention here.

In typhoid fever and in ulcer of the stomach also sometimes a perforation similar to the hole made by a bullet occurs, and the contents of the intestines or of the stomach are poured out into the abdominal cavity. Of course, every one knows that if this went on for a brief time death would necessarily follow. In the lower animals we cannot produce exactly the conditions following perforating ulcer of the stomach and perforations such as occur in typhoid fever; but, in consequence of the knowledge acquired by experimenting upon gunshot and incised wounds of the stomach and bowel in the lower animals, we finally woke up to the fact in 1884 that a perforation after such an ulcer, either in the stomach or in the bowel from typhoid fever, ought to be closed. In 156 cases of such perforation of the stomach operation has been done, and the recoveries have been 46.80 per cent. But in the last 54 of these operations done from 1896 to 1898 the percentage of recoveries has risen to 64.82 per cent. In 362 such operations done for perforation of the bowel in typhoid fever up to 1904 the recovery rate was 25.97 per cent. Some individual surgeons have saved one in three, and ultimately, I believe, one half of such patients will be saved. It must be remembered

VIVISECTION

that in such perforations of the stomach and bowel *every patient* would die were no operation done. To save one half or even one third is a surgical triumph.

I have several times alluded to cutting out a portion of the bowel and uniting the two ends. This involves a number of problems which ought not, and, in fact, cannot, be studied in man because of the fact that it is wholly inadmissible to test such operations (which always involve life) on man when they can be tested accurately and more quickly by experiments on animals and without involving human life.

I have stated that by many experiments on animals we have now reached a satisfactory solution of the problem how the two ends of the bowel are best sewed together. But one other question was still unanswered—how much of the bowel could be removed and yet life be preserved. A similar question, we have seen, has been answered in respect to how much of the liver could be removed by Ponick's experiments. How much of the bowel could be removed was a most important question. We would all presume that a few inches, possibly even a foot or two, might be removed without danger; but when we remove a larger portion we cut down the digesting and absorbing surface to such an extent that it is a question whether the patient can still live. This has been determined upon animals, and then, as occasion required us to decide the question, in man. As a result of the knowledge derived from animal experimentation I saw a few years ago in Montreal a man from whom Shepherd had removed over one third of the entire length of the bowel (eight feet) which was involved in a large tumor; and yet the patient was in capital health for a long time after the operation.

Hydrophobia.—The search for the germ of this dreadful disease has as yet been fruitless; but happily the search for the means of prevention has been crowned with success. Of every 100 persons bitten about 15 contracted hydrophobia, and of those bitten on the head and face at least 80 per cent die of hydrophobia. Up to the time of Pasteur *every* person who contracted hydrophobia died, that is, the mortality was 100 per cent. The Pasteur treatment, which is entirely the result of animal experimentation, by preventing its occurrence, has reduced the mortality to less than 1 per cent of the persons bitten. And yet the establishment of Pasteur Institutes for the benefit of the human race has been resisted most strenuously by those opposed to vivisection.

Transplantation of Bone.—In 1867 Ollier a celebrated French surgeon who recently died, by experiments on animals showed that the membrane which covers the bones (the periosteum) could be peeled off a bone and transplanted to a distance into the tissues of the same animal, or even of another animal, and that it would there live and produce new bone. These experiments, very crudely described in these few words, have been extraordinarily fruitful in several directions.

First, in certain cases it is necessary to remove diseased or dead bone. These experiments showed us that if in removing the bone the periosteum was carefully guarded and left behind it would reproduce the bone. In some cases in which the lower jawbone has died as a result

of phosphorus poison in the employees of phosphorus match factories, the dead bone has been removed, but the periosteum has been preserved and a new jawbone has been reproduced. Another result has been that, instead of amputating, for example, an arm when the elbow is diseased, we can remove the bone and by preserving the periosteum can preserve a more or less useful joint.

In other cases a certain area of bone, as for instance, in the skull, is chiseled loose or otherwise separated from the surrounding bone excepting for an inch or two at the portion where the chief blood supply enters the flap. The bone is then forcibly broken at this unchiseled portion and turned back, the periosteum and scalp acting as a hinge. When the tumor has been removed, the abscess opened, or other needful operation done, the trap door is simply closed by replacing the flap, the scalp sewed in place and the integrity of the skull is restored. One can see that this is an immense advantage over having a great hole left in the side of one's skull.

In some cases, in which, in consequence of accident or abscess, a large hole already exists in the skull, we either chisel off bits of adjacent bone or replace the bone by a plate of celluloid and successfully fill this opening.

Again, in certain cases, for example, in which the jaw has been fractured, a bit of the bone has been chiseled loose from the patient's jaw and has been grafted in place as a bridge between the two fragments, so relieving the deformity or remedying an otherwise incurable fracture.

Again, a certain small number of children are born without any bone at the back of the spine in the neck or the loin (*spina bifida*). Through this opening the membranes of the spinal cord protrude and form a tumor which, if untreated, in most cases proves fatal. We now operate most successfully on most of these cases, and in suitable cases either chisel loose a bit of adjacent bone and transplant it, so as to close the opening, or in other cases take a bit of bone from one of the lower animals to fill the opening and cure the patient.

Again, in certain cases of fracture of the arm bone (humerus) the nerve going to the muscles on the back of the forearm, which winds close around the bone in a spiral, is torn in two; these muscles are paralyzed, and the patient has what we term "wrist drop," so that the hand is useless. In such cases the knowledge derived from two different series of experiments comes to our aid to enable us to remedy the trouble. First we find the two ends of the broken nerve, freshen these ends, unite them, and in many cases can change a useless hand into a useful one; but if so much of the nerve has been destroyed that the two ends cannot be brought together we now deliberately remove an inch or two of the arm bone, thus shortening the arm enough to bring the two ends of the nerve in contact and sew them together, and in a good percentage of cases we can again restore the hand to usefulness after months and occasionally even after years.

A still more remarkable transplantation of the bone is accomplished in some operations on the skull. In some cases it is necessary to remove a button of bone which may be an inch and a half or two inches in diameter in order

VIVISECTION

to do an operation on the brain. The operation which has necessitated this removal of bone may require an hour and a half or two hours. If we want to replace the bone so as not to leave an opening in the skull through which the brain may easily be dangerously injured we put the bone in a basin of hot salt solution or weak antiseptic solution, and by keeping it at a proper temperature, at the end of the operation, when it has been totally detached from the body for so long a time, we replace it and its vitality is not lost.

All of these various operations (and others which I have not time to describe) done on bone, to the immense advantage of our patients, are the direct or remote results of the experiments of Ollier and others on the transplantation of periosteum and of bone in animals. The indirect results are quite as valuable, and sometimes more valuable, than the direct results of such experiments.

An illustration of the indirect results of Ollier's experiments is shown in the transplantation of the skin. One of the oldest operations in surgery is the making of a new nose. When the nose has been lost a suitably shaped flap was cut on the forehead, leaving a sufficient uncut base for a proper blood supply so that the flap would not undergo gangrene. The flap was then turned by twisting it on its base and was sewed in place where the nose had been. The experiments of Ollier and his successors showed, however, that periosteum, and even so dense a structure as bone, could be entirely detached from the body for a long time and yet not lose its vitality. Hence we now transplant bone as well as skin to make firm instead of flabby noses. This has led us of late years to apply the same procedure to the skin, and enables us now to do far more extensive and more successful operations than would otherwise have been possible. The first method tried in man was that of Réverdin, of Geneva. He cut little bits of skin only as big as a pin's head from the arm or the thigh, not quite skin deep, and planted them on any raw surface which did not heal readily. These grafts under proper treatment adhere and form new centres from which healing of the wound takes place. Emboldened by this, Krause and other surgeons have taken very large pieces of skin, including often the whole thickness of the skin, and transplanted them. For example, in some cases of extensive cancer in which a very large portion of skin must be removed, now, while the patient is under the influence of the anæsthetic, we take strips of skin an inch wide and several inches long from the thigh, or, in other cases, from another person who is willing to give up a portion of his skin. These pieces are immediately placed on the raw place left by the removal of the tumor, and as they do not lose their vitality but grow fast to the tissues under them, the wound is healed almost immediately, instead of taking a long time for the slow formation of a scar.

One of the most difficult of all wounds to heal is an extensive burn, such as is produced by the clothing catching fire. In these cases large surfaces of the skin on the chest or the abdomen slough off, resulting in great ulcers. These sometimes take months, sometimes years, to heal, and in not a few cases never heal, no matter what is done. Now, as a result of our ex-

perience, first with the periosteum and bone and then with small bits and then larger bits of skin, we transplant strips of skin as just described, and heal such wounds in a very short time. One sees in the newspapers every now and then accounts of some woman whose long hair has been caught in machinery and almost all of the scalp torn away. These wounds are healed by transplanting skin in a similar manner.

The Blood.—We are at present only just beginning to appreciate how much we can learn from examination of the blood, especially by new methods lately introduced. Almost every intelligent person knows that the blood consists, roughly speaking, of a fluid in which float small circular disks, about $\frac{1}{100}$ part of an inch in diameter, called the red blood cells. In addition to these there is in the blood another kind of cell called the white blood cell. The red blood cells are made up chiefly of a substance called hemoglobin, which gives the color to the blood. Some of the investigations, which are really only at present at the beginning of their usefulness, are as follows. They are good illustrations of how inductive science begins by ascertaining facts. If they are valueless they are disregarded; if of value they are studied still further. It is not unlikely that the blood may soon be one of the most fruitful sources of the knowledge by which surgery may profit greatly:

First, the number of white blood cells. It is found that in case inflammation results in an abscess the number of white blood cells is increased several times. Ordinarily in a little cube of blood one millimetre (the twenty-fifth part of an inch) on each of its sides the number of red blood cells is about 4,000,000 to 5,000,000, and the number of white blood cells is 8,000 to 10,000.

If one has an abscess, the white blood cells as a rule will rise to 15,000, 20,000, 25,000 or more to the cubic millimetre—a condition that we know scientifically as "leucocytosis." In certain cases when it is a question whether an abscess exists (as, for instance, in the brain, in the liver, and other parts of the body in which the diagnosis is very difficult to make) if the leucocytosis or its absence will show us absolutely that there is or is not an abscess present, it would be of the greatest help.

Again, in typhoid fever the pain and tenderness exist just above the right groin. In appendicitis the pain and tenderness exist in the same region, and in not a few cases it is extremely difficult to distinguish between these two diseases. Especially is this true at the beginning of such an illness, just when it is most important to make the right diagnosis and institute the correct treatment. If the presence of leucocytosis will show us distinctly that it is appendicitis, and the absence of leucocytosis that it is typhoid fever, an immense gain in accuracy of diagnosis, and, therefore, of the proper treatment, will result. To open the abdomen, if it is typhoid fever (without perforation), would be a dreadful mistake; not to open it, if it is appendicitis, would be, as a rule, equally wrong treatment. If the leucocytosis is a sure guide we cannot learn it too quickly. It seems very reasonable, therefore, that experiments should be made in the lower animals by producing abscesses and determining whether under many varying conditions leucocytosis is always present

VIVISECTION

when there is an abscess and always absent when there is no abscess.

Second, the hemoglobin, which makes up the bulk of the red blood cells, is the means by which oxygen is carried to all parts of the tissues. Whenever an anesthetic, such as ether or chloroform, is given, the amount of hemoglobin is distinctly diminished, and by this means the oxygenation of the blood is hindered. In certain conditions of the system the percentage of hemoglobin is diminished to 60, 50 or even as low as 25 per cent of the normal. If an anesthetic is given to a person with an already diminished percentage of hemoglobin this percentage is still further diminished, and the oxygenation of the blood still further hindered. If, then, the percentage of hemoglobin is very small before an operation the danger of giving an anesthetic is very marked; if the hemoglobin is as low as 30 per cent it is very likely that the patient may die upon the table irrespective of the operation, simply because the anesthetic reduces the hemoglobin to such a point that the blood does not absorb enough oxygen to carry on life. Some authorities have stated that we ought never to give ether or chloroform to a patient whose hemoglobin is below 50 per cent. Others have placed the limit as low as 30 per cent. Surely this subject which is very recent and about which we know up to this time very little, ought to be investigated with the greatest care in animals rather than to decide the question by sacrificing life by venturing to give an anesthetic to patients whose hemoglobin is at so low a point as to be inconsistent with safety.

Other recent researches are those on the temperature at which the blood freezes and the lapse of time after the blood is drawn from the body before it coagulates—that is, clots. A small portion of blood drawn by a prick of the finger enables us to determine these four conditions—that is, (1) the presence or absence and the degree of leucocytosis; (2) the percentage of hemoglobin; (3) the freezing temperature of the blood, and (4) the coagulation time of the blood. We are beginning to see that these last two as well as the first two will probably prove of the greatest value in reference to surgical operations. Hence we ought to learn accurately and quickly all the facts in the case by experiments upon animals, and so avoid dangers to human life, of which until lately we have been quite ignorant.

These would include experiments upon animals fasting, or after feeding; after being bled; after surgical operations have been done upon them; after an anesthetic is given to them; when the anesthetic is administered for a short time, for a longer time, for a very long time, or for a time long enough to kill them, in order to determine what the effect of the anesthetic is in fatal and non-fatal doses. It is of the utmost importance that we should know exactly and speedily the result of all these conditions. If we are debarred from learning them by experiment on animals, then the human race must go without the knowledge we seek, saving as it is revealed to us from time to time by studying slowly and inexactly the results in man. With certain modifications due to the slight differences between man and animals the conclusions drawn from experiments on animals apply to man.

Let me give one instance which confronts

the surgeon not infrequently. An abdominal section is occasionally followed by very great and, it may be, dangerous and alarming depression. One of the most difficult things to determine in some cases is whether this condition is due to the shock of the operation or to internal hemorrhage. Thus hemorrhage differs from that which may follow an amputation or removal of a tumor from the neck, etc., by the fact that it is concealed within the abdomen, and its existence can only be inferred. If the patient is suffering from shock, stimulation, heat, quiet, certain drugs, etc., will be resorted to to enable him to recover. If it is due to internal hemorrhage, we must instantly reopen the abdomen and tie the bleeding vessel. To do the latter operation when the patient is only suffering from shock might prove fatal; not to do it, if hemorrhage is the cause of the depression, is certainly fatal. No one not a surgeon can appreciate the anxiety, the careful weighing of evidence, the intense longing for some positive means by which a correct diagnosis may always and surely be made, which every surgeon feels in such an emergency.

It is possible that by examining into the presence or absence of leucocytosis, by determining the percentage of the hemoglobin, or possibly even the coagulation time and the freezing temperature of the blood in a number of operations in human beings, we might be able positively to determine the difference between shock and internal hemorrhage, but only after making many blunders, each of which would cost a human life. In an animal we can open a blood-vessel in the abdomen and let it bleed for a longer or shorter time, and determine positively the leucocytosis, the hemoglobin, etc., the animal meantime suffering nothing because it would be under an anesthetic. Which is the right, which the kindest, which the most humane way of finding out the truth? This is an illustration of the painlessness to animals of such experiments and their priceless value to human beings.

Experiments to Enable us to Make a Reliable and Speedy Diagnosis.—In some cases in which the diagnosis is difficult, or may require considerable time, experiment upon animals aids us greatly, and so is of immense value to man. Thus in supposed anthrax, or wool-sorter's disease, a most dangerous malady, by inoculating a guinea pig with the discharge the diagnosis can be cleared up quickly and proper treatment instituted. If a case suspected to be one of bubonic plague arises the diagnosis can be established within 24 or 36 hours by a similar injection into a rat or a guinea pig, the apprehensions of a community (to say nothing of the patient and his friends) relieved and the greatest damage to its commerce averted by discovering that it is not the dreaded pestilence, or, if it is the plague, by showing the necessity for most stringent measures of prevention. I do not think any community will or ought to allow sympathy with the unavoidable suffering of a few rats or guinea pigs to weigh in the balance against the safety of many human lives or the ruin of large business interests.

An amusing instance of how sentiment gives way before affection and facts occurred not long since in England. The brother of the Duke of Newcastle was bitten by a dog supposed

VIZAGAPATAM — VIZCAINO

to be rabid. The duke was a vice-president of the Anti-Vivisection Society, but knowing that whether the dog was rabid or not (and, therefore, whether his brother was in danger or not) could only be settled by inoculation experiments upon animals, he took the dog to Mr. Horsley, in London, and had the experiment done—and promptly was compelled to resign his office in the society.

By similar means anthrax and actinomycosis (or lumpy jaw, which spreads to man as well as to herds) among cattle are diagnosed and eradicated; glanders in horses is recognized and stamped out and tuberculosis in cows is eradicated, not only preventing its spread to healthy cattle, but through the milk to many human beings, especially young children, whose chief diet must be milk.

By similar experiments on animals chicken cholera, hog cholera, Texas fever, cattle plague, and many other diseases of cattle, sheep, horses, hogs, poultry, and other animals have had their causes discovered and the means of prevention or of cure demonstrated. The reports of the Bureau of Animal Industry at Washington enter into these in detail. Surely the poor animals which have benefited so greatly from such experiments should pray to be saved from their friends if these beneficent researches are to be prohibited.

I often wonder what would have been the influence on surgery if the young man who first took ether in the Massachusetts General Hospital on 16 Oct. 1846, had died. Morton, it is true, had experimented on some dogs first, but, as we now view it, very inadequately. Had this patient died, would not the use of ether have been deferred for years, possibly even till now, and meantime the human race all over the world have gone on suffering the horrible tortures of the pre-anesthetic days and all our modern progress in surgery have been prevented?

If the sacrifice of the lives of even a considerable number of animals enables us to reach the benevolent purposes a few of which I have described, is it not plainly a moral duty to perform them so as to obtain this knowledge? Is it not wrong to hinder such benevolent researches? Especially is it not wrong so to hinder research when, in the vast majority of instances, animals suffer little or nothing? In almost all experiments not only can an anesthetic be used, but in all involving difficult and delicate operations it is essential to do so; for it is impossible to do such an operation on an animal struggling from pain. Not only, therefore, does sentiment lead the vivisectionist to spare the animal all the suffering that is possible, but scientific accuracy points in the same direction. A very few experiments, principally those on the nervous system which require us to determine the presence or absence of sensation, cannot be done with an anesthetic; but these experiments are few and far between. Some experiments also (for instance, those on lockjaw, to which I have already alluded) by producing the disease, necessarily make the animal suffer; but if by the suffering of a few animals, human beings suffering from lockjaw can be cured, or, still better, if we can learn the cause of the disease and so can prevent it from attacking human beings, is it not worth the suffering? The infliction of suffering is not cruelty. If one dear to us meets

with an accident far away from surgical aid and we spur a horse to the utmost, so that finally it drops dead in the frantic effort to bring surgical assistance, I am sure no one would accuse us of cruelty, although we had inflicted torture upon the horse. So this infliction of pain on a small percentage of animals experimented on is not cruelty, but is the greatest kindness to other animals and to a much higher animal—man himself.

I have been able in this paper only to select a few illustrations of the progress that surgery has made by experimentation on animals. Practically, as I said at the beginning, nearly all of these have occurred during my own professional life, and I speak, therefore, of what I know. Although I myself am not a vivisectionist, yet I could not do the work I do every day and accomplish results I do were it not for just such work, of which I take advantage. In view of these facts, therefore, how unwise it would be to restrict and still more to abolish such life-giving and pain-saving results of vivisection, especially when the animals themselves benefit from these experiments almost as much as man. I have not referred to any of the older experiments, such as those remarkable experiments of Jones on the methods of tying blood-vessels in the early part of the last century, nor of Sir Charles Bell's experiments by which he determined the functions of the two different roots of the nerves just as they emerge from the spinal cord, nor of the circulation of the blood as discovered by Harvey. All these are fundamental; and without the knowledge derived from them we should be a century or more behind where we are now. I have preferred rather to take modern instances with which I am personally familiar in order to illustrate the subject which I have been asked to describe. I cannot believe that any unprejudiced, fair-minded reader will not agree with me that such humane purposes should be fostered and not hindered; should be encouraged and not abolished.

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Vizagapatam, vē-zā'gā-pā-tām', India, a town, capital of a district of the same name, in the Madras Presidency, at the entrance of the Veragatam into the Bay of Bengal, about 180 miles northeast of Masulipatam. It is a military station and has a good harbor, a modern water supply, sanitary system, hemp manufactures, and an export trade in rice and sugar. Pop. about 50,000.

Vizcaino, vēth-kā-ē'nō, Sebastián, Spanish navigator: b. Huelva, about 1550; d. Acapulco, Mexico, about 1615. After being prominent in Mexico he headed exploring expeditions from Acapulco to Lower California, 1596-7, and in 1602-3 along the California coast to latitude 43°, discovering the bay which he called Monterey, and sent a vessel which appears to have reached the mouth of the Columbia. He also sailed to Manila and Japan, 1611-14, carrying Franciscan missionaries to Japan, and was the earliest to attempt to establish commercial relations between Spain and Japan. His reports of his voyages to California were printed in Torquemada's 'Monarquía Indiana' (1615), and the greater share of his narratives, including that of

VIZETELLY — VIZIER

his voyage to Manila, was included in De Navarrete's 'Coleccion de Viajes y Descubrimientos' (1625-9).

Vizetelly, viz-è-tèl', Edward Henry (**BERTIE CLARE**), English journalist and was correspondent, son of H. R. Vizetelly (q.v.): b. Chiswick, England, 1 Jan. 1847; d. London 13 April 1903. He was educated at the Imperial Lyceum, Saint Omer, France. At the outbreak of the Franco-Prussian war he became special correspondent for the *New York Times* and the *London Daily News*, served as orderly officer on the staff of Garibaldi, and was present at Dijon and at Langres; subsequently he engaged in the Kabyle insurrection of 1871, served in the Russo-Turkish war of 1877-8 and in the Greek insurrection of the latter year. He founded the *Cyprus Times* in 1881 and the *Times of Egypt* at Alexandria in 1882. At the bombardment of Alexandria on 11-12 July 1882 he was the only Englishman in the city, and during the firing sent half-hourly despatches to London. In 1888 he commanded the *New York Herald* relief expedition sent in search of Stanley in Africa, and met him in East Africa in 1889. He was the author of 'Reminiscences of Bashi Bazouk'; 'From Cyprus to Zanzibar'; 'The Warrior Woman'.

Vizetelly, Ernest Alfred, English journalist and editor, son of H. R. Vizetelly (q.v.): b. London 29 Nov. 1853. He was completing his education in Paris when the Franco-Prussian war broke out and he became correspondent for the *Yorkshire Post*. After the close of the war he accompanied his father in the capacity of artist through Austria, Spain, Portugal, and Italy until 1886, when he joined the editorial staff of Vizetelly & Company. Subsequently he engaged in journalism, and has translated into English the greater part of Zola's works. As a novelist he has written 'The Scorpion' (1894); 'A Path of Thorns' (1901); and 'The Lovers' Progress' (1902). He edited an edition of 'The Hep-tameron, English Bibliophiles,' planned by his father (5 vols., 1894); his other publications include: 'The True Story of Chevalier d'Eon' (1895); 'Bluebeard, Comorre the Cursed, and Gilles de Rais' (1902); 'Emile Zola, a Biography' (1904).

Vizetelly, Francis (Frank) Horace, son of H. R. Vizetelly (q.v.), American editor and encyclopedist: b. London 2 April 1864. He was educated at the Lycée Baudard, Nogent-sur-Marne, France, and at Arnold College, Eastbourne, Sussex. From 1888 to 1891 he was engaged in business with his father at London, and in the latter year came to the United States. In 1891 joined the editorial staff of the 'Standard Dictionary,' for which he prepared the definitions on wines, and from the date of the publication of that work was the assistant of the editor-in-chief in all subsequent editions issued, revising the entire work for the edition of 1903, when he became associate editor. During 1893-4 he filled the position of associate editor of the 'Home and Country Magazine,' was revising editor of the 'Columbian Encyclopedia' in 1896, of the 'Cyclopedia of Classified Dates' in 1899, and also was one of the editors of Hoy's 'Cyclopedia of Practical Quotations.' He investigated in 1901 the conditions prevailing in the Boer detention camp at Bermuda, the only civilian accorded that privilege by the British authorities, and published his report in the leading Amer-

ican and English newspapers. He is secretary of the editorial board of the 'Jewish Encyclopedia' and manager of the editorial department of that undertaking. Among his writings are: 'The Story of the Wheel' (1898); 'The Fan in Romance and History' (1898); 'The History of the Glove' (1899); 'The Boer as a Prisoner of War' (1901); 'The Crime of the Congo' (1903); etc.

Vizetelly, Henry Richard, English newspaper proprietor, editor, publisher and writer; b. London 30 July 1820; d. Tilford, near Farnham, England, 1 Jan. 1894. He came of a family of printers and stationers, was educated at Clapham and at Chislehurst, and was later apprenticed to a wood-engraver, an art in which he became proficient, his most notable work as an engraver being a series of illustrations drawn by Birket Foster (q.v.) for Longfellow's 'Evangeline.' He took a prominent part in founding 'The Illustrated London News' in 1842, and was one of the founders of the 'Pictorial Times' in 1843, a pioneer enterprise in illustrated journalism, published the first English edition of 'Uncle Tom's Cabin' in 1853; established the 'Illustrated Times' in 1855; the 'Welcome Guest' in 1858; and in 1865-76 was correspondent of the 'Illustrated London News' at Paris and at Berlin. He was appointed representative of the British government on wines at the Vienna Exposition in 1873 and at Paris in 1878, and for his labors at the former was created by the Austrian emperor chevalier of the Order of Franz-Joseph of Austria. In 1880 he established a publishing house in London, and engaged in issuing translations of the works of foreign authors, chiefly Russian and French, and in 1884 began to publish translations of the works of Emile Zola. The literal translation of the works of the novels of the French realist, however, aroused a storm of protest, and in 1888 he was indicted on the charge of publishing obscene libels, and, on the advice of counsel, pleaded guilty and agreed to withdraw the edition of Zola's works. Thereupon he was fined £100 (\$500) and required to enter into his own recognizances to be of good behavior for a period of six months. In 1889, in harmony with his understanding of the undertaking given, he decided to issue an expurgated edition of the works of Zola. Notwithstanding the deletion of all the passages to which objection had been raised, he was indicted a second time, and, being then 71 and broken in health, he, following advice of counsel, again pleaded guilty, and was sentenced to three months' imprisonment as a first-class misdemeanant. His writings include: A series of monographs on wines, entitled 'Wines of the World' (1875); 'Facts about Sherry' (1876); 'Facts about Champagne' (1879); 'Facts about Port and Madeira' (1880); 'The Story of the Diamond Necklace' (2 vols., 1887); 'Berlin under the New Empire' (2 vols., 1879); 'Paris in Peril' (3 vols., 1882); and two volumes of literary reminiscences; 'Glances Back through Seventy Years' (1893); etc.

Vizier, vi-zēr, a title given to high political officers in the Turkish Empire and other Mohammedan states. In Turkey the title is given to the heads of the various ministerial departments into which the divan or ministerial council is divided. The president of the divan or prime minister is known as grand vizier.

VLADIKAVKAZ — VOGEL

Vladikavkaz, vlā-dē-kāv-kāz', Russia, a fortified town in Caucasus, capital of Terek district, situated on an elevated plane at the northern base of the Caucasus, about 90 miles north of Tiflis, with which it is connected by a military road through the Dariel gorge. It is connected by rail with Rostov and with Petrovsk on the Caspian, and is rapidly developing as a commercial centre.

Vladimir I., vlā'dī-mīr or vlā-dē'mīr, Saint, "the Great," Russian emperor, son of the Grand Duke Sviatoplav: d. Beresnyx, Russia, 1015. He received from his father in 972 the government of Novgorod, notwithstanding his illegitimacy, and the remainder of the empire was divided between the lawful heirs, Jaropalk and Oleg. Jaropalk killed Oleg in a quarrel in 977, and Vladimir escaped a similar fate only by flight. In 980 Vladimir returned with an army, overthrew and caused the assassination of Jaropalk, and became sole ruler of the empire. He then extended his boundaries from the Black Sea to the Baltic, and founded his capital at Kiev. While besieging the Christian city of Cherson in the Crimea he decided to demand the hand of Anna Romanovna, sister of Constantine IX., the Byzantine emperor, in return for a cessation of hostilities. The demand was granted, and by this princess Vladimir was converted to Christianity. The Greek Church was established in Russia, and Vladimir's subjects willingly embraced the new faith. The character of the emperor seems completely to have changed after his conversion. He built churches and monasteries, abolished capital punishment, and in his private life substituted chastity for the former licentiousness. He divided his empire among his 12 sons, and after his death was canonized in the Greek Church, while in 1782 the "Vladimir Order" was founded by Catharine II. Consult Karamzin, 'History of Russia' (1816).

Vladimir II. Monomachus, Russian emperor, great-grandson of Vladimir I.: b. 1052; d. Kiev, Russia, 19 May 1126. Contrary to the Slavonic law, he succeeded to the throne in 1113. He possessed both valor and ability, and under his wise rule Russia enjoyed a period of great prosperity. He married Gida, daughter of Harold of England, and the famous Valdemar of Denmark was his grandson. He wrote a "Testament," which is valuable as a picture of the manners and opinions of the day. Consult Rambeau, 'History of Russia' (1886).

Vladimir, Russia, (1) a town, capital of the government of same name, on a lofty and wooded bank above the Klyazma, 105 miles northeast of Moscow. It is one of the oldest towns in Russia; and has a 12th century cathedral, a theological seminary, considerable manufactures, and a trade in fruit, particularly cherries. From 1157 to 1238 it was the residence of the Russian grand princes. It was twice sacked in 1238 and 1410 by the Tartars. Pop., 28,315. (2) The government has an area of 18,864 square miles. It has an undulating surface with a general slope toward the east, and is not very fertile. The drainage is all carried to the Volga by the Oka and its tributary, the Klyazma. The province is rich in archaeological remains of the Paleolithic and subsequent ages. There are important manufactures of linens and woollens and several blast-furnaces.

Vladivostok, vlā-dē-vōs-tōk', Asiatic Russia, a fortified seaport town of Eastern Siberia, on the harbor of the Golden Horn in the Gulf of Peter the Great, Japan Sea. It was founded in 1861, and is an important naval station of Russia, and the eastern terminus of the Trans-Siberian Railway, the first sod of which was cut at Vladivostok, 24 May 1891, the line being opened in December 1901. The harbor is surrounded by hills which are well fortified. It has large dry docks, waterworks, electric street railways, and street lighting plants, two large shipbuilding yards, and 60 new mechanical shops. Vladivostok is an open port, and has lines of steamers running to Japanese and Korean ports and a line opened in 1900 to Seattle, Wash. Ice-breaking steamers keep the harbor open in the winter months. A Japanese squadron bombarded Vladivostok early during the Russo-Japanese war of 1904, but without inflicting any serious damage. Pop. about 38,000, including nearly 25,000 soldiers, and numerous Chinese, Japanese and Koreans. See TRANS-SIBERIAN RAILWAY.

Vodka, a Russian intoxicating liquor, distilled from rye, and much used by the peasants of Northern Europe.

Vogdes, Israel, American soldier: b. Wiliston, Pa., 4 Aug. 1816; d. New York 7 Dec. 1889. He was graduated at West Point, and served in Florida against the Seminole Indians in 1840-56. He was captured by the Confederates 9 Oct. 1861, while repelling their attack on Santa Rosa Island, Fla.; released in August 1862; and as brigadier-general of volunteers commanded Folly Island, S. C., in April-July, 1863. He was promoted colonel, U. S. A., 1 Aug. 1864; commanded the defenses at Portsmouth and Norfolk in 1864-5; was brevetted brigadier-general, U. S. A., in April of the year last named; and was retired at his own request in January 1881.

Vogel, fō'gēl, Eduard, German explorer: b. Crefeld, Prussia, 7 March 1829; d. Wara, Wadai, 8 Feb. 1856. He was educated at Leipzig and at Berlin, making a special study of astronomy and natural science. In 1851-3 he assisted Hind at Bishop's Observatory in London, and in the latter year was selected by the English government to conduct an expedition to join that of Clapperton, Barth, and Overweg in Central Africa. He sailed from England 20 Feb. 1853, and on 13 Jan. 1854 reached Kuka, the capital of Bornu. From this point he made several expeditions into the surrounding country, and on 1 Dec. 1854 met Barth near Zinder. He penetrated south to Yacobi and the Benue, and on 1 Dec. 1855 returned to Kuku. From this time his notes of his explorations cease, but subsequent information discloses that he set out to the east on 1 Jan. 1856, reached Wara in Wadai, and was there assassinated. For his notes consult 'Erinnerungen an einen Verschollenen,' by his sister, Elise Polko (1863); also Pahde, 'Der Afrikaforscher Eduard Vogel' (1889).

Vogel, Hermann Wilhelm, German photochemist and spectrum-analyst: b. Dobrilugk, Lower Lusatia, Prussia, 26 March 1834; d. Berlin 17 Dec. 1898. He studied at the Royal Industrial Institute of Berlin, in 1860-5, was an assistant in the mineralogical museum of the University of Berlin, and from 1884 was director of the photo-technical laboratory of the

VOGEL—VOICE AND VOICE CULTURE

Technical Institute there. He twice visited the United States (1870, 1883). His studies were directed in particular to the processes of photochemistry, the absorption-spectrum, and the spectra of oxygen, nitrogen, and hydrogen. His silver-tester, photometer for pigment-printing and heliotype-printing, and universal spectro-scope were introduced into general use. Among his writings was a 'Handbuch der Photographie' (4 ed. 1890-4).

Vogel, Sir Julius, Australasian statesman: b. London 24 Feb. 1835; d. near there 12 March 1899. He was educated at the London University College School and at the Royal School of Mines, and in 1851, attracted by the discoveries of gold in Australia, went to Melbourne. He engaged in journalism, and in 1861 established in Otago, New Zealand, the *Daily Times*, the first and still the leading morning newspaper in that colony. In 1863 he entered the New Zealand House of Representatives and in 1869 he was appointed colonial treasurer, and subsequently was postmaster-general, commissioner of customs, and prime minister. He resigned the latter office in 1876 and was agent-general for New Zealand in London in 1876-81. In 1884 he re-entered New Zealand politics, was elected to Parliament and again appointed treasurer, but in 1888 resigned and returned to England. He was afterward engaged under the New Zealand government in London until his death. He greatly furthered immigration to New Zealand, was instrumental in building railways, was active in bringing about the Australasian federation, and secured the passage of a law for inscribing colonial stocks. He was knighted in 1875. His writings include: 'Great Britain and Her Colonies' (1865); 'Official Handbook of New Zealand' (1875); 'A. D. 2000,' a novel; etc.

Vogelwulde, fô'gêl-vî-dê, Walther von der. See WALTHER VON DER VOGELWEIDE.

Vogler, fô'glêr, Georg Joseph, German musician and composer, known as the "Acht Vögelchen"; b. Würzburg 15 June 1749; d. Darmstadt 6 May 1814. He studied at Bamberg, Mannheim, Bologna, and Padua; was ordained priest at Rome in 1773; and made Knight of the Golden Spur, and protonotary apostolic and chamberlain to the pope. Returning to Mannheim in 1775 he established there his first school of music. From 1786 to 1799 he was nominally resident at Stockholm, where he conducted another Tonschule; but he was constantly touring Europe as a performer on the organ. In 1807 he settled at Darmstadt as kapellmeister, and there conducted his most successful school, at times giving concerts in German cities. Vogler made a great stir in his time as theorist and organist, not being excelled on the instrument. He attempted revolutions in organ-building. He is known as the subject of Browning's 'Aht Vogler.'

Vogt, fôkt, Karl, German naturalist: b. Giessen, Germany, 5 July 1817; d. Geneva, Switzerland, 5 May 1895. He was graduated from the University of Bern in 1833 and was associated with Agassiz in the preparation of 'L'Histoire naturelle des poissons d'eau douce de l'Europe centrale' in 1839. He was appointed professor at Giessen in 1847, where his political opinions soon caused his dismissal, but in 1852 he was chosen to the chair of geology at

Geneva, which position he occupied until his death. He led an expedition to the North Cape in 1861 and in 1878 was elected a member of the Swiss National Assembly. He was an advocate of Darwinism and a materialist in opinion. His works include: 'Physiologische Briefe' (1845-6); 'Ocean und Mittelmeer' (1848); 'Die Säugethiere in Wort und Bild' (1883); etc.

Vogüé, vò-gü-ê, Charles Jean Melchior, MARQUIS DE, French archaeologist: b. Paris 18 Oct. 1829. He was a student of Oriental religion, languages, and art, traveled in Syria and Palestine in 1853-4 and 1861-2, was ambassador at Constantinople in 1871-5, and from then until 1879 occupied that office at Vienna. He became commander of the Grand Legion of Honor in 1879, was elected to the French Academy in 1901 and is president of the Agricultural Society of France. His publications include: 'Les Eglises de la Terre-Sainte' (1859); 'L'architecture civile et religieuse dans la Syrie Centrale' (1865-77); 'Inscriptions sémitiques' (1869-77); 'Mémoires de Villars' (1889); 'Le Duc de Burgoyne et le Duc de Beauvilliers' (1900); etc.

Vogüé, Eugène Marie Melchior, VICOMTE DE, French critic and historian, cousin of C. J. M. Vogüé: b. Nice, France, 25 Feb. 1848. He was educated at Paris, served in the Franco-Prussian war, entered the government service in the department of foreign affairs in 1871, was attaché at Constantinople in 1873, secretary of the legation at Saint Petersburg in 1876, and in 1882 resigned to enter upon a literary career. He was elected to the Academy in 1888 and in 1893-8 was député de l'Ardeche. His publications include: 'Syrie, Palestine, Mont Athos' (1876); 'Les portraits du siècle' (1883); 'Le Roman russe' (1886); 'Œuvres russes' (1894); 'Jean d'Agrèze' (1898); 'Le rappel des ombres' (1900); etc.

Voice and Voice Culture. The art of singing was developed to meet the demands of modern music. That which we understand as the science of voice culture, or the means of cultivating the singing voice that it may be used as a musical instrument, came into being after music had shaped itself to express strong emotional sentiment. In the closing years of the 16th century the attempt to restore Grecian art in its several branches led to the invention of new forms of musical expression. Previous to that time, little, if any, music was written for the solo voice. There was no demand, therefore, for especial training for singing. The new forms given to music were (1) the opera, in which dramatic action was united to musical setting of the story. The story was given out by single voices, by two in dialogue, by three, four or more in unison or harmony. The plot of the opera was, from the beginning, in comedy or tragedy and secular in nature; (2) oratorio, which certainly at first was much like the opera, except that the story was from sacred writ. A form of composition invented at this time was recitative which was, and ever has been, for the single voice. Advances in these forms of composition have exacted more and more of singers. Invention of modern music created the need of special training of the singing voice and advance into larger forms of musical expression has kept the demand for

VOICE AND VOICE CULTURE

greater skill on the part of vocalists ever increasing. As modern music came into recognition in Italy (in Florence, about the year 1600) the first definite system of voice culture began there. It was devised by the composers that their operas and oratorios might be sung as they wished them sung. There was no definite plan accepted for general use during the first century of modern music.

Every composer sought some means by which to have his compositions well sung, and each followed his own course. In 1686 was born one destined to establish a semblance of order. Niccolò Porpora, born at Naples, became a composer. His operas were very florid and none were found among singers able to cope with them. His earnestness for his own interests made him, an educated man for his age, devise a better system of vocal training than had ever been used. And for the first time was established a vocal method. It was the beginning of the Old Italian method, some form of which was continued to our own time. Unfortunately, Porpora left no record of his manner of teaching. We must judge what he did from the demand his music made. His writing for solo voices called for great flexibility and range of voice and his phrases were of great length. We must suppose from this that his pupils were taught to sustain the breath a long time, to sing smoothly and rapidly and to touch with delicacy and lightness the notes in the extremes of the voice. Probably his personality was commanding and that he curbed with masterful hand all attempts on the part of his pupils to depart into anything outside these few requirements. Farinelli, one of his greatest pupils, departed from the simplicity of Porpora's rules, but not until after Porpora passed away. It is known that Porpora kept his pupils many years at work on the simplest exercises. It is related that Caffarelli, one of his most noted pupils, studied a single page of exercises for seven years and when he finally became restless, the master said: "You may go now; you are the greatest singer in Europe." Perhaps one reason why so little is known of Porpora's vocal method is because he did not remain long enough in one place to found a school which could preserve records. He wished for fame as a composer and went from city to city to make his works known. His pupils followed. That, on the other hand, spread the good vocal teaching. In every large city of Italy and in many Austrian and German places the effect of his good teaching was felt. Porpora lived till 1767 and will ever have the honor of establishing vocal method. It was not, so far as we know, scientific, yet it was definite and could be understood. His pupils who continued at Naples maintained his traditions conscientiously for a century. Others who were attracted to London, Paris and Vienna kept up a form of Porpora's vocal method. Farinelli, after a wonderful career as singer and politician (having been the power behind the throne of Philip V. of Spain), retired to Bologna where he passed the last 23 years of his life. Bologna had the honor of establishing the first great music school (which began in 1482) and was the musical centre of the day. Farinelli did not become a singing teacher by making it his profession, but he trained many of the singers who were connected with the theatre. In this

way, he more than any other, handed down the Porpora method. Nearly all the composers of the day came into contact with that method and for the first time in the history of music, vocal method influenced composition. Mozart had singing lessons with pupils of Porpora. Haydn was accompanist to Porpora for three years. Rossini was born into the Bologna life. Bellini, Donizetti and Mercadante were all educated at Naples where the traditions were most rigorously preserved.

Into our own day the influence of the Old Italian method has been projected through two distinct lines: that of Francesco Lamperti and of Manuel Garcia. Each has, perhaps, departed from the old rules, necessitated by the changed conditions of music. Before considering the work and vocal methods of these two men it is well to see if in the remark of Mancini, himself a great singing teacher and a fellow pupil of Farinelli, we may gain a little more definite knowledge of the principles of Porpora. Mancini says regarding Farinelli, "The art of taking and keeping the breath, so softly and easily that no one could perceive it, began and died with him. The qualities in which he excelled were the evenness of his voice, the art of swelling its sound, the *Portamento*, the union of the registers, a surprising agility, a graceful and pathetic style and a shake so admirable as it is rare." So far as known there is no more complete description of vocal method of that day.

Lamperti, judging from his pupils who are very well known, kept most closely to that method. He was born in 1813 and when seven years of age entered the Conservatory at Milan for the study of piano and composition. He was ambitious to manage opera companies when he became a man and shaped his training for the theatre. He associated himself, eventually, with the manager of the small theatre at Lodi. That seems to have been his only venture in theatrical management, but it served to shape his life in an unexpected manner. Financial resources being small he was forced to train the local singers for the solo parts. He was so successful that many of those peasants attracted attention and were engaged for the theatres of London, Paris, Saint Petersburg and other European cities. It makes the most striking example in history of the power of one man to create a school of singing. Their successes led many great artists to visit Lamperti at Lodi, and his popularity caused the government to make him professor of singing at the Milan Conservatory in 1850. For the next 25 years many of the greatest singers studied with Lamperti and this made Milan the centre of the operatic world. In 1875, Lamperti was retired on a pension, but continued as a private teacher until his death in 1893. Even Lamperti did not write a vocal method. Mr. Griffith, one of his earnest pupils, gathered slips of paper on which he wrote comments for his pupils and from them has given us a little idea of the method. One remark by Mr. Griffith is, "Basing his teaching upon the study of respiration, the taking and retention of the breath by means of the abdominal muscles alone, and the just emission of the voice, he thoroughly grounds his pupils in the production of pure tone." That is not unlike the remark of Mancini about Farinelli's method. If the Old Italian method has come into our

VOICE AND VOICE CULTURE

day in any degree of purity it has come through the adherence of Lamperti to those principles of breath control.

Manuel Garcia, Sr., was born eight years after Porpora died. In 1812, when 37 years of age, he studied at Naples under Anzani, who was particularly zealous in preserving traditions. Garcia, too, was to be an impresario and his thought was given to the training of singers for his own companies. But, with these duties, he saw the advantage of having a school at London. This was established in 1823. His own children were trained by him and three of them became celebrated. Maria, known as Mme. Mahbran, was one of the greatest singers of any age but lived to be but 28 years of age. Mme. Viardot-Garcia, still living at Paris, was born in 1821. She served as accompanist for her father and learned his method more from absorption than from actual lessons. She grew up in the highest musical life of the day. Manuel Garcia, Jr., was born in 1805, still living at London, became one of the most important men in connection with vocal method. He sang for a few years in his father's companies, but elected to adopt teaching as a profession. He was one of the first men to become a vocal teacher who did not have special interest in producing his own operas or in preparing singers for his own companies. It is probable that he has the honor of establishing the vocation of voice teaching on professional lines. Whether that be so or not he made scientific investigation of the voice on which he established a distinct vocal method. He invented the laryngoscope, a device for examining the throat, including the vocal chords and larynx. This has become universally adopted by physicians. Garcia was able, with his examinations, to announce definite facts about the action of the throat in singing. Action had been observed previously through sensation and because it had manifested itself through the outer flesh. It is worthy of remark that although earlier teachers were obliged to walk by faith rather than by sight they had not gone far from correct ways. Nor did Garcia's discoveries add much knowledge. It permitted him and his followers to move with greater certainty. It led to the formation of vocal method on the idea of tone-placement. The registers of the voice assumed more definite position as factors in method. Whether Garcia became so interested in the scientific action of tone production and its reflection in chambers of resonance, as to obscure his views of respiration, or whether he became convinced that respiration was not important, does not appear. But he ignored very thoroughly that which was fundamental in Lamperti's work. He established a method with new basic principles, and that method sprang into popularity. At that time in the history of vocal method there were two distinct systems: one based on empiricism; the other on science. The first took into account the sound of the tone and judged what would make it good; the other explained the scientific action which would produce good tone. As each method has produced many noted artists there need be no comment on the merits of either. The advocates of both schools have held quite closely to the tenets of the two great leaders, although modifications, as well as additions, have been made. Modern music continues its greater demands and dis-

coveries in science compel further adjustment of deductions based on scientific vocal research.

In 1845, Mathilde Graumann, now Madame Marchesi, became the pupil of Garcia, the inventor of the laryngoscope. For a time she acted as assistant to Garcia and, as it was just the time of Garcia's deep study which led to the establishment of a new vocal method, it is reasonable to suppose that she was influenced by that in forming her own. Her husband, Salvatore Marchesi, was also a pupil of Garcia. The "Marchesi" method is more often mentioned than is any other to-day and it has the Garcia principles for its foundation. Many of the great opera singers have been guided in their education by Madame Marchesi. It is, however, a matter of comment that these artists differ radically in vocal method, and probably the teacher has considered the individuality of her students more than she has adherence to vocal method. Nor would this necessitate departure from Garcia's principles, for such is the subtlety of the mind in dealing with vocal machinery, there is always need of adaptation of method to traits of mind which are individual. And that ability so to adapt may constitute the "Marchesi" method. It may be even the establishment of a new method.

Italy, ever the home of opera, has adopted vocal method which more dramatic music demands. Language is a factor in creating or changing vocal method. The flowing tone of the Italian, with every word ending in a vowel or liquid consonant and with guttural and harsh consonantal combinations almost eliminated, does not lend itself well to the tone placement of the Garcia school. Nor is the method of Lamperti sufficiently vigorous to meet dramatic demand. A compromise seems to have been effected. Breathing is the basis of it, and it is the breathing of the upper chest, with the abdominal muscles held inward with great firmness. This enables its votaries to utilize to a certain extent the scientific tone placement of Garcia. The combination leads to tone production with a degree of harshness which was foreign to the older Italian method. Few professional singers have become prominent under its leading.

Opera demanding extremely dramatic voice has found favor in Germany, and vocal method has been devised on lines which are not part of either of the older schools. Nor is it possible to make explanation of the German method on scientific grounds. The voice is used explosively and with less attempt to sustain the smooth flow of tone which has ever been deemed essential to good singing. Yet the public has learned to enjoy German singing, which is most convincing proof that there is reason for it. Wagner, it is said, did not hope that his operas would ever be sung well nor could they be given in any school of voice training which existed when they were written. In the German method of training the voice is found a way by which the operas can be sung. And this class of music is the only one to which that method can be applied. Explosive tone is quite out of place in the music of song writers even among Germans.

Language has influenced the formation of a method in vogue among the French singers. The nasal consonants of the French language

VOICE AND VOICE CULTURE

call for decided nasal resonance, and the vocal teachers of Paris seek to obtain such resonance as the predominating factor in tone production. In the department of breathing they exact high chest breath control. With this as foundation and with exaggerated nasal resonance there is shrillness of tone emission. The difference between French method and modern Italian lies in the point of resonance of tone. The Italian places the tone in the forward part of the mouth, and the French in the nasal chambers, while both use high chest breath control as foundation.

The other nations have no distinctive vocal methods. England and America have been content to follow the lead of other peoples. Many individual teachers have, through their strong personality, made reputations as teachers, and the public has accredited them with vocal methods quite their own. Thus, William Shakespeare made international reputation as having a vocal method. In some particulars it is individual, but it is based on that of Francesco Lamperti which was as nearly as can be the Old Italian method.

One system which had no special home but which has scientific basis and has many advocates is the "Overtone" method. Theory claims that every musical tone is compound in that it consists of the vibration of the tone-producing organ as a whole for the initial tone and the vibration of its aliquot parts as added tone. For example, the tone made by the stroke of the hammer on the piano string vibrates the string its whole length, its half length, quarter length and eighth length. Also, the divisions at the third, fifth, sixth and seventh of the whole vibrate. Sensitive ears can detect the lower multiples of the rate of vibration of the note struck. Using the piano string one can demonstrate the truth of this theory. The tones added to initial tone have been called "harmonics," "upper partials" and "overtones." Some vocal teachers believe the vocal chords have action which corresponds to that of the piano string and have constructed a vocal method which seeks to incorporate upon the initial tone an abundance of "harmonics." Other teachers of the overtone method claim that every part of the resonance chamber of the throat and mouth is a point of birth of "harmonics." They then seek to make junction of these voices with the initial tone made by the vocal chords. One ingenious scientist has shown this theory can be illustrated by a series of flames which register what vibration of aliquot parts is given each tone. Photographs are made of the flames. It makes a visible record which enables a student of sufficient intelligence to direct his practice.

In the studios of vocal teachers "Open and Closed Tone" method is often spoken of, but it is doubtful if a distinct vocal method has ever been built on this idea. Garcia advocated using open tone in the low voice and closed in the upper. Lamperti advised open tone throughout the voice, at least in practice on exercises and vocalizes. It would seem as if "open and closed tone" method is a varying adjunct of several methods, rather than distinct vocal method by itself.

In the last few years a theory has been advanced which may serve as ground for a new method. It is that tone is primordial substance,

present in everything, as is electricity; that by stimulating vibration in the vocal machinery at the proper rate to make audible the tone which is present, our musical tone is produced. Voice culture, in this system, consists of stimulating the sounding machinery at just the right degree of vibration, soliciting above all, such counter balance of effort that the act of singing is unfeigned and the appearance of effort hidden. This method further contemplates that transmission of tone is made amplification of the vibration of the vocal machinery.

Examination of all methods of training the voice in vogue emphasizes the belief that none can have universal endorsement. This comes about because there are so many views of music and of the requirements for singing modern music. All unite in saying that singing should be without effort; but such is the difference in perception of sensation that what seems effortless to one appears charged with effort to another. The latter fact points out the need of some scientific measure by which test may be made of this important element in singing. A barometer or thermometer would establish a vocal method. The one to invent such an instrument has not been found. Garcia opened the way for scientific examination of the voice, but no one has advanced in the science and Garcia's discoveries did not create a method generally endorsed. Among vocal teachers it is common saying that there are two vocal methods, the good and the bad. Each believes his to be good, but as they differ very much all cannot be good. All know that breath must be used to create vocal tone; that tone emission must be with comfortable action in the throat; that transmission of tone must be generous and the tone given be vibrant. The way to secure these constitutes good method. Every teacher has his own way by which to attain these desirable ends, and the individuality prevents general acceptance of any one system. Again, vocal teachers who depend on their individuality are little likely to invent any scientific testing machine. Method which can have universal acceptance and application will come only from deductions made by practical teachers working out the suggestions which scientific men make, which will come from invention. The telephone came near showing new forms of transmission and reception of tone. It supplied the idea that tone is awakened into audible vibration and endorsed the teachers of the "Primordial" method. Nor is it certain but that further experiments in which electricity plays an important part will supply views on which to base vocal method. It is a subject of vast importance. In this, vocal methods for singing have been considered because training the voice for that art is supposed to be the most important and extended training the voice can have. When we think of the large number of actors, elocutionists and public speakers and recall that each needs to use true principles of voice culture, the importance of having a definite and universally applicable vocal method seems almost imperative. When we realize that the constantly used conversational voice would be an infinitely more valuable implement of communication between human beings were it cultivated as it might be, the need of perfect (and universal) vocal method assumes large proportions. If, as many believe, voice

VOICE, SPECIAL FEATURES OF ORGANS OF

culture is one of the most valuable prophylactic and therapeutic agents known, such need is absolutely imperative.

Schools of music have been established in all large cities, and of course the study of singing has been made prominent. It has not, as a rule, been the chief study. It has been forced to fourth place, composition, piano and instrumental playing having been given precedence. Wherever the study of singing has been given special prominence it has attracted more students to the school and has made more lasting impression on music. Thus, Lamperti made Milan with its conservatory, noted. The Royal Academy at London has, since the day of Handel, had a large number of great vocal teachers and that has given power to the school. The New England Conservatory and the Chicago College of Music have produced many excellent singers, but the fact remains that none has advocated special vocal method. Training has been on lines widely separated and left entirely to the judgment of individual teachers. As all have produced results, although using means so different, it is evident that training the voice for singing modern music can be had through the personality of the teacher developing the musical nature of the student. This has taken the place of method. Many teachers, in late years, have written treatises on singing and which are intended, although frequently not so claimed, to be descriptions of vocal methods. Garcia's method was described in a book issued about 1865. It has since been revised and simplified. Madame Seiler, Madame Marchesi, and Messrs. Randegger, Behnke and Alberto Bach have described their methods in print. Nor must we forget some very excellent works by American writers. Frederic Root, D. A. Clippinger and Edmund J. Myer have written clearly and well on vocal methods. As their works are the latest and they are men grown into the strong thought of present activity, their writings have definiteness which was lacking in many earlier works. There is a growing belief that American teachers are taking the most advanced position with regard to certainty in method, and that study of singing can best be prosecuted with such teachers. That which is most evident in their work is that they combine scientific with empirical teaching, and they bind the whole together with directing power of intellect and soul. At no time has it been possible to ensure that anyone possessing any degree of vocal resources shall become an acceptable singer as it is now. This is true, in spite of the fact that never before has music demanded so much of singers.

Judging from methods of the past and present we may believe that the voice for singing can best be trained on the following general lines, allowing, of course, that individual natures demand departures and special applications:

There are three general departments: physical, intellectual and spiritual. The latter refers to the intuitional and emotional action of the spirit of man. The physical training has in it development of respiration, freedom of the throat and reverberation of tone. Respiration demands that muscles of inspiration and expiration shall be made free and strong and made to balance their action so as to deliver breath pressure to the vocal chords, which make initial tone, in such way that tone is made without apparent

effort. This corresponds to the way of the Old Italian method. It seems a simple thing, but the old singers evidently found it necessary to study and practise it every day for years and perhaps for lifetime. Freedom of the throat means that tone of every gradation of power, from softest to loudest, shall be emitted in purity; that elasticity of muscle shall permit constant and instantaneous changes in the larynx, that the chambers above the larynx which influence quality shall be supple, and that the organs which regulate articulation shall not be interfered with, even in the slightest degree, while performing their duties. Reverberation has in it the whole matter of tone-placement, vibration and transmission of musical sounds. Such use of physical training draws, then, from the empirical ways of the old school, the scientific method of the Garcia system and the ways of the "overtone" method.

The intellectual department of modern method demands of the student knowledge of anatomy and physiology; directing power of the mind; and familiarity with psychology. Education of the objective mind is the controlling factor in this part of vocal method. To small extent has it been used in any earlier methods. It is probable that in that department the strongest factor in modern vocal method is found. For the intuitional or emotional side has ever been used and perhaps singers of the past (notably Farinelli) cultivated this side to perfection.

Intuitional influence in modern method is not left to chance as possibly it has been before. A real student of our times is led to understand his relation to the controlling force of the universe and to utilize the power he may obtain through what is often termed "higher thought." But it is not left to be expressed "intuitionally." That is, the student learns what imagination, sentiment, will and the like are, and then, through his objective mind (intellectual department) directs their influence upon the physical parts. For it is now known that, however carefully, correctly and thoroughly the machinery of voice is used, there is a voice better and more beautiful than such machinery can, by itself, produce. The development of vocal method, thus very briefly outlined, is engaging the serious attention of the best American teachers who make teaching a profession, and there is evidence that such study is making a new vocal method.

FRANK H. TURNER,
Editor 'Music Life.'

Voice, Special Features of Organs of, in Man. The vocal organs of man and apes are similar, basically, in structure; but in man all that enters into the perfecting of the speaking voice has been vastly improved. In the first place man has fortunately discarded or rendered vestigial the voice-pouches occurring in certain man-like apes, permitting these animals to produce demoniacal sounds which make night hideous. Whatever vestiges of these appear in man are found connected with the larynx, behind the Adam's apple. The complete command over the product of voice man secured when the alveolar arch and palatine area became shortened and widened; and when the tongue, by accommodation to the modified mouth became shorter and more horizontally flattened. The control of the tongue, again, was accomplished by his

VOICE, SPECIAL FEATURES OF ORGANS OF

gaining possession, on the inner centre of the ordinary human jaw, at the central curve or symphysis forming the chin, of a small bony tubercle, known as the genial tubercle, the movements of the tongue, as an organ of speech, being effected mainly by the action of the muscle inserted into this tubercle, absent in some primitive "human" jaw bones; and entirely absent in the man-like apes.

It was the rise of man in the world and the gaining of complete equilibrium in his erect attitude, that, however, was one of the chief means of readjustment as it was one of the specific evidences of human advance. It gave man a wider horizon, opened up his dormant imagination; raised his chin and his chest. The chest was freed from the pressure of the bowels, giving freedom to the development of the lungs, as the source of supply and control of the breath. The man who stood best before his fellows was the man whose voice carried further. This was accomplished by the greater resonating power of men who "possessed nose." Blaise Pascal (1662) had already noted a concrete example: "If the nose of Cleopatra had been shorter the whole face of the earth would have been different." This is a fact that science is only now explaining. The Romans, large nosed, were leaders and conquerors. They were strong men; and strong men had strong passions; the orientals call an angry man a "man of nose." Command and passion speak in short tones; and "syllables govern the world." In giving command a short word is always used: Oppian advised the giving of short names to dogs from this very fact.

But the force impelling speech is, at last, psychical. Hence the necessity of the study of the brain in connection with speech. The faculty of language has been found to have close relations with one of the frontal convolutions, which is anatomically most perfect in man, in anthropoids rudimentary, and in the inferior monkeys entirely absent. The location of the zone of speech is in one hemisphere only, according as the individual is right- or left-handed. Its location is the opposite to the side of the hand preferred: in most, or right-handed, persons, it is on the left, and *vice versa*. "Right-handedness and speech are controlled by the same hemisphere of the brain and from contiguous areas; so that if right-handedness was first used for expression before speech that speech has arisen from the setting aside for further development of the area in the brain first used for right-handedness. The indication of the close association of right-handedness and speech in the same location of the brain, might suggest that they developed together. That is, that as soon as man began to use his arms for the possession of the necessary food for hunting, he might have contemporaneously or simultaneously gained some progress in utterance" (Baldwin).

The nourishment of the psychical basis, the brain, is therefore essential. It is the supply of blood to the brain that controls our emotions: bounding freely through the arteries of the brain it effects our consciousness as an emotion of the exalting class. Rapid thought, hurried speech, vigorous gesture, are results of strong body excitement caused by dilation and increased blood flow, controlled by the sympathetic nervous system. On the other hand with contraction of the arteries, that is, lessened

blood flow, we have sluggish thought, languid movement, and uncertain speech. Meinert has calculated that the brain may contain six hundred million cells, each of which contains an incalculable number of atoms. Hence the importance of nourishment, which means growth. Here the experiments of Elmer Gates of Washington, may be referred to, as he demonstrates the necessity not only of proper brain nourishment through the blood, but of their nourishment, in proper environmental associations. Speech, appealing to the sense of hearing, the capacity of audition, on the part of the listener, as well as that of the speaker (it being found that the speaker hears his own voice differently from the listener) is a feature that is undergoing careful study.

The child's speech apparatus is of much smaller dimensions than in adult man. The resonance chamber is smaller, and more energetic adjustments have to be made whenever definite resonance is required, by changing the angle of the jaw, the position of the tongue, or the conformation of the lips. The lungs have not sufficient depth; the pectoral muscles are but slightly developed, the breathing is accomplished much more through the diaphragm than through the active expansion of the pectoral cavity, hence breathing movements are more superficial and irregular than in later years. Speech requires complete control of the breathing mechanism, which the child has not yet got, while he still wants in his organ a large number of "strings, whistles and registers," the larynx being still small and undeveloped; and so with the tongue, the lips and the muscles moving them; while the teeth are still entirely wanting. The undeveloped condition of the auditory apparatus and the brain have also to be taken into account.

Lastly, in regard to the highest development of the human voice in song, the action of the three hollow spaces, nasal, oral and laryngeal, has much to do with the modification and modulation of the singer's voice. These spaces are to the vocal bands what the violin is to the strings; and, for every tone and vowel the mucous membrane of the spaces named must be drawn into a special position (including the position of the larynx) before the air in the spaces can be brought into vibration by the action of the vocal bands. But the vibration of the cords alone is never the tone. The surfaces of the mucous membranes are drawn into different shapes, particularly fit to produce tone-waves or to disturb them, and to produce in such tone-waves, not only fundamental tones, but over-tones. The tongue is a large and direct agent in formation, in the middle or oral space, as it is connected with the upper part of the larynx; its derangement in action being alone sufficient to utterly destroy tone, or, on the contrary, when well adjusted and hanging normally in relation to the other voice parts, to give what is termed the silvery quality to the voice. These spaces are as important in producing the modification and modulations of the singing voice as are the vocal cords and intrinsic muscles of the larynx; there being no doubt, however, that the movements of the larynx depend upon and are controlled by the muscles and movements outside that organ. The control of the motive power, the breath, is of the utmost importance in maintaining the

VOICING—VOLATILE OILS

fixation and cord stretching of the vocal mechanism.

From the above it will be seen that speech is a product of mechanism finely adjusted and controlled by forces of the highest mental development, making man what he is. See **SPEECH, ORIGIN AND NATURAL HISTORY OF.**

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ROBERT C. AULD, F.Z.S.

Voicing. See REED, FLUTE, AND STRINGED INSTRUMENTS, CARE OF.

Voit, foit, Karl von, German physiologist: b. Amberg, Bavaria, 31 Oct. 1831. He was educated at Munich, Würzburg, and at Göttingen, and in 1863 became professor of physiology at the University of Munich. He was early engaged in scientific researches, his first achievement of importance occurring in 1854, when he proved the presence of urea in the muscular tissues of cholera patients. He subsequently made a specialty of questions of digestion and assimilation. His works are numerous, and among them are included: 'Physiologisch-chemische Untersuchungen' (1857); 'Ueber die Kost in öffentlichen Anstalten' (1876); 'Untersuchung der Kost in einigen öffentlichen Anstalten' (1877).

Vokas, vōka, (Theodora) Rosina, English actress: b. 1858; d. Torquay, Devonshire, 27 Jan. 1894. She first appeared at the Alhambra Palace, London, in the 'Belles of the Kitchen.' In 1885-93 she toured North America. She took leading parts in 'The Parvenu,' 'The School-mistress,' 'The Milliner's Bill,' 'The Circus Rider,' 'Maid Marian,' and 'A Pantomime Rehearsal.' She was married to Cecil Clay in 1880, and for a time retired from the stage.

Volapük, vō-lā-pük, a proposed universal language invented about 1879 by Johann Martin Schleyer, of Constance, Germany. The name means "world-speech," being based on English *world* and *speech*, and a number of the vocabularies are modified English words, the total number in the language being about 14,000, some 1,300 being root-words. Its structure the language is simple and extremely regular, and the orthography is entirely phonetic, the words being pronounced as they are written, and *vice versa*. The study of Volapük, after having made some progress, has latterly declined; but there are still periodicals written in it, and associations devoted to its dissemination. Various other attempts to provide a universal language, especially one suited for commercial purposes, have been made in recent times. See ETYMOLOGY; PHILOLOGY; SCIENCE OF LANGUAGE.

Volatile Oils, or Essential Oils, vegetable oils distinguished by the possession of pungent, characteristic odors, and by the fact that they can be vaporized without decomposition, and usually without any considerable residue. The volatile oils differ from the "fatty oils," or "fixed oils" (of which olive oil is an example), from a chemical point of view, in consisting mainly of hydrocarbons, and in containing little or no true fat.

The known volatile oils are very numerous,

and are obtained from plants, or parts of plants, or from vegetable exudations, mainly by the action of heat or pressure, or by the solvent action of fats. In some cases, as in the extraction of the essential oil in orange peel, a portion of the oil may be obtained by placing the material containing it in horse-hair bags, and subjecting it to pressure. Distillation is also commonly employed, the plants or parts of plants containing the oil being placed in a still with water, the contents of the still being constantly stirred, and heated by means of a steam-jacket. The boiling points of the volatile oils are mostly higher than that of water, but as they possess a considerable vapor tension at the boiling point of water, they distil over at that temperature in sufficient quantity to make the process commercially practicable. In some cases, it is found to be advantageous to raise the boiling point of the water in the still somewhat, by the addition of salt. When the oil that is to be prepared is injured by exposure to the temperature of boiling water, it is customary to extract the oil by macerating the plant with grease. In the preparation of perfumes, for example, it is common to treat the flowers containing the oil with pure lard or paraffin, which is kept fluid by a water-bath. The fat extracts the volatile oil, and when the charged fat is afterward shaken up with alcohol it gives up the oil, in large measure, to the alcohol. The process known as "enfleurage" is essentially the same as the one just indicated, except that it is not conducted by the aid of heat, the grease being allowed to remain in contact with the flowers for a longer time, at a lower temperature; the oil then being recovered from the fat by means of alcohol, as before.

The following are the more familiar of the essential or volatile oils:

Oil of Bitter Almonds.—Prepared by distilling the pulp that is left after the fixed oil contained in the almonds has been expressed by pressure. It consists mainly of benzaldehyde, C_6H_5CHO , and boils at $179^\circ C$.

Oil of Bergamot.—Prepared from the unripe fruit of *Citrus Bergamia*, by squeezing the rind by hand and wiping the expressed oil off with a sponge, the sponge being squeezed at intervals into a collecting vessel. It contains a considerable quantity of the hydrocarbon citrene, $C_{15}H_{26}$, together with other compounds whose precise nature has not yet been thoroughly investigated. The oil is extensively used in perfumery.

Oil of Cloves.—Obtained by distilling the flower buds of *Caryophyllus aromaticus*. It consists of a mixture of sesquiterpene and eugenol and is heavier than water.

Oil of Eucalyptus.—Prepared by distilling the leaves of the eucalyptus tree. It is pale yellow in color, and is used in medicine and in perfumery. Its chief constituent is cineol, $C_{10}H_{18}O$.

Oil of Lavender.—Prepared by the distillation of lavender flowers, the best quality being made from *Lavandula vera*. Oil of spike is an inferior variety, prepared from *Lavandula Spica*. Oil of lavender is used in perfumery, and oil of spike is extensively employed in porcelain painting.

Oil of Lemon.—Prepared from scarcely ripe lemon rinds by the sponge method, described above under "Oil of Bergamot." An inferior variety is also prepared by distilling the residue

VOLCANIC ROCKS—VOLCANO

remaining from this process. Oil of lemon consists chiefly of limonene, $C_{10}H_{16}$, a hydrocarbon which resembles the citrene of oil of bergamot, but which differs from it in certain particulars. Oil of lemon is used in confectionery and perfumery.

Oil of Origanum, Oil of Thyme, or Marjoram Oil.—Obtained by distillation from certain species of marjoram.

Oil of Peppermint.—Prepared by distilling the herb *Mentha piperita*. It consists chiefly of a solution of menthol in various terpenes, and is used in medicine and as a flavoring, especially in confectionery.

Attar (or Otto) of Roses.—Prepared by the distillation of certain species of roses, and especially from *Rosa Damascena*, which is cultivated in Turkey. It is used extensively in perfumery, and, on account of its high commercial value, is often (and perhaps always) adulterated. The most common adulterant is "geranium oil," which is manufactured expressly for adulterating attar of roses, by distilling a species of grass that grows in India.

Oil of Turpentine.—Prepared by distilling the resinous exudations from certain species of pine trees. American oil of turpentine is prepared chiefly from *Pinus australis*, and consists mainly of dextro-pinene, a hydrocarbon having the formula $C_{10}H_{16}$, and boiling at 156° C.

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Volcanic Rocks. Those igneous or pyrogenic rocks which have reached the surface through volcanic necks or through fissure eruptions. Volcanic rocks were formed in all ages of the earth's history, but were generally more or less restricted geographically. Contrasted with them are the rocks which cooled beneath the surface to which the name plutonic is generally applied. Extrusive (effusive) and intrusive are other terms used for these rocks. At best this distinction is only one of convenience, and has no great scientific value. Among the more important rocks of this type may be mentioned, obsidian, pumice, rhyolite, trachyte, felsite, andesite, and basalt (qq.v.).

Volcano (Ital. *volcano*; from Lat. *Vulcanus*, the god of fire; originally the volcano of Etna, the fabled abode of the god), an opening in the crust of the earth from which proceeds heated gases (hydrochloric, sulphurous, etc.) sometimes in flames, volumes of steam, eruptions of ashes mixed with scoriz and large stones which are often red-hot, and of molten rock, called lava. The phenomenon is chiefly limited to certain regions in different parts of the earth, known as volcanic districts; and in these districts established and permanent vents may continue constantly sending forth smoke and flame, like Stromboli on one of the Lipari Islands in the Mediterranean; or eruptions of more severe character may take place at irregular intervals. The matter thrown out from volcanoes generally accumulates around the openings or craters till they build up a hill, or even a mountain several thousand feet high; but the vent may continue for a long time at a low level, and is even formed beneath the sea, sometimes without rising above the surface. Instances have occurred of a volcanic eruption suddenly forming an island in the midst of the sea. Other volcanoes that have been suddenly raised up

have remained permanently in the form of mountains. Such is the volcano of Jorullo (q.v.) in Mexico. The greatest volcanic mountains, as Etna, Hecla, and Vesuvius, are produced by accumulations of volcanic matters, as beds of lava, ashes, and scoriz, sometimes alternating with beds deposited beneath the sea charged with the vestiges of marine animals, the collection of which must have occupied long periods of time. This is especially apparent in the case of Etna. Volcanoes sometimes remain inactive so long as to lose their peculiar character; but they may at any time break forth again. Vesuvius was not known to the ancients as a volcano, though it was apparent from the form of the mountain and the materials of which it was composed, that such must have been its character at some former period. Volcanoes which show outbursts of more or less frequency are called *active*. Those known to have been active in historic times, but long quiescent, are called *dormant*. Ancient volcanic mountains are met with in Hungary, in central France, and other places, of whose eruptions no record exists. Such are termed *extinct* volcanoes, but they may at any time become active. Probably the most general understanding of a volcano is of a conical hill or mountain. There is, however, no limitation as to height, some comparatively low volcanoes, such as Pelée and Soufrière, manifesting violent and disastrous eruptions, while, on the other hand, such lofty peaks as Kilimanjaro, Cotopaxi, and Popocatepetl are of a volcanic character.

As generally considered, a volcano is divided into three fundamental parts—the base, or elevation proper; the cone, rising steeply from the base; and the crater, the depression occurring at the summit of the cone. These parts are not invariably present in distinct form in all volcanoes; in many, eruption takes place without any crater. Nor do eruptions always proceed from the crater, when present; the crater being located at the summit of the cone, while activity is in many cases exhibited independent of the crater by supplementary craters in additional cones, broken out on the slopes of the mountain. Craters of course vary greatly in size and sustain no proportional relation to the mountain or elevation. Haleakala (island of Maui, Hawaii), 10,000 feet, has a crater of 20 miles' circumference; but the crater of Orizaba (Mexico), on the boundary between the states of Vera Cruz and Puebla), $3\frac{1}{2}$ miles, has a crater with a diameter of less than 1,000 feet.

The causes of volcanic action are still much obscured, though various explanatory theories have been advanced. In early times, the rising cloud of dust attending an eruption, lit by the glow of the lava, came readily to be regarded as mingled smoke and flame, and blacksmith-gods were thought to have their forges in the subterranean regions. The view now generally accepted is that internal heat, which increases toward the earth's centre, causes the evolution of a great body of elastic vapor, which, expanding and seeking an outlet where there is the least resistance, manifests itself in the upheavals and explosions of an eruption. The body of vapor is thought to be derived from the superficial mass of the earth, become hydrated, or combined with water. Such action, as well as the presence of the molten rock known as lava, is accounted for by vast internal displacements,

bringing the inner crust, with its high temperature, nearer to the surface. Volcanoes are, in general, to be found in areas where the earth's crust is of an inferior strength. These areas are naturally ocean-basins, the territory bordering on such basins, or the ranges of mountains marking or flanking the outlines of the continents. With the possible exception of Wrangel (Alaska) no active volcano exists far inland save in a district which is either the scene of a comparatively recent displacement or is marked by an instability in the earth's crust. One of the chief lines of distribution surrounds the Pacific Ocean, running along the western coast of South, Central, and North America; the Aleutian Islands, Kamchatka, and the Kurile group; Japan, Formosa, the Philippines, the Moluccas, the North Hebrides, New Zealand, and South Victoria Land. Included within this line are numerous other volcanoes, such as Kilauwa, Mauna Loa, and Mauna Kea (Hawaii), and those of the Polynesian Islands. In the Atlantic section are the Antilles, the Canaries, the Azores, the Cape Verde, Iceland, Madeira, etc. The European line follows the Mediterranean, and is continued into eastern Asia, about the Caspian. It includes the Lipari Islands, the Ægean Islands, Etna, Vesuvius, Ararat, and Demavend. J. W. Judd ('Volcanoes' 1881) estimated that there are from 300 to 350 vents of customary activity. There are perhaps about an equal number whose latest activity was at a date comparatively recent.

The phenomena of volcanic activity are numerous and varied. A great portion of the material upheaved in an eruption is lava. The kinds of rock composing this are largely silica and silicates, those containing a relatively small percentage of silica being called basic, and those containing considerable silica, acid. The acid variety of lava is the lighter; sometimes it does not move from the lava vent, and when it does it generally proceeds a short distance only, solidifying in a thick mass. The basic is much more liquid, and covers the slopes of the mountain or forms a lake on the adjacent plains. When lava is imperfectly fused and large quantities of steam are present, the lava becomes, as it approaches nearer the surface, filled with bubbles, which continue to expand, lightening the lava and facilitating its upward movement. At the surface, the lava is torn apart by the steam, the fragments being hurled high in the air. These fragments are known as cinders, or, when finer, ashes. There are also numerous accessory phenomena, such as earthquakes (see EARTHQUAKES); electric and magnetic disturbances; and various acoustic manifestations. The explanations of these phenomena have not yet been satisfactorily reached. One of the most remarkable examples was the disturbance of the magnetic field throughout the world which accompanied the Pelée eruption of 8 May 1902. Contrary currents of air also occur, some advancing before the clouds of the eruption, others moving toward the volcano, apparently into vacuum caused by the abrupt explosion of steam. The geysers of Yellowstone Park, the solfatarae (vents from which proceed sulphurous fumes) of Italy, etc., are signs of a decreasing volcanic activity in the areas where they occur. Consult: Darwin, 'Volcanic Islands' ('Voyage of the Beagle' 1839); Lyell, 'Principles of Geology,' Vol. I. (1872); Green, 'Vestiges of a Molten

Globe' (1874); Dana, 'Characteristics of Volcanoes' (1890); Judd, 'Volcanoes' (1881); Scrope, 'Volcanoes' (1872); Mallet, 'Volcanic Energy' ('Philosophical Transactions' of the Royal Society 1873); Russell, 'Volcanoes of North America' (1897); and Heilprin, 'Mount Pelée and the Tragedy of Martinique' (1903). See also articles on individual volcanoes.

Vole, an assemblage of rodent mammalia, belonging to the muridae, or rats and mice, and distinguished by the enamel of the rootless molar teeth being folded in the form of a double series of alternating triangles. The ears are very short and rounded, and the soles of the feet are hairless and tuberculate, while the tail is relatively short. The body is stout and heavy, the legs short and the movements clumsy. The voles and their immediate allies form a sub-family (*Microtina*) of the *Muridae*, known in this country as meadow-mice or field-mice (q.v.). Consult Miller, N. A. Fauna No. 12, U. S. Dept. of Agriculture; Bailey, Id. No. 17; and Stone and Cram, 'American Animals,' New York, 1902.

Volga, *völ'gä*, a river in Russia, the longest in Europe. It rises among marshes and small lakes beside the Valdai Hills, in the government of Tver, at an elevation of about 550 feet above sea-level, and falls into the Caspian Sea by many mouths, at Astrakhan. Its basin has an area of about 563,300 square miles, and its entire course, including windings, is about 2,200 miles in length, while its fall from source to embouchure is only 630 feet. It flows at first southeast about 90 miles to Zubtsov, thence generally northeast past Tver to Mologa, thence east by south past Yaroslavl, Kostroma and Nijni-Novgorod, to the vicinity of Kasan. Here it turns south, flows circuitously south-southwest, past Simbirsk and Saratov to Tsaritsyn and Sarepta, making a marked eastward bend at Samara, and thence southeast to the Caspian. At Tsaritsyn it sends off a branch, the Akhtuba, which flows parallel to the main part of the river, and is connected with it by many cross branches. Its principal affluents are the Oka and Kama, the one joining it from the southwest, the other from the northeast. The Volga is navigable almost from its source, and below Nijni-Novgorod it floats quite large vessels; but its navigation is impeded by shallows and sand-banks, and in winter by ice. Passenger steamers similar to those of American rivers ply upon it. By a judicious system of canals it communicates with the Caspian, Baltic, Black, and White Seas. The short railway from Tsaritsyn to the river Don has diverted much of the traffic from the lower Volga and the Caspian to the lower Don and the Sea of Azov. The banks of the Volga are fertile, and often well-timbered. The river abounds in fish, particularly sturgeon, carp, and pike of extraordinary size.

Volhynia, *völ-hin'i-a*, Russia, a southwest government, bounded north by Grodno and Minsk, east by Kiev, south by Podolia, and west by Austrian Galicia and Poland; area, 27,743 square miles. The capital is Zhitomir. In the south there are spurs of the Carpathians, but the north is low and largely marshy. The whole drainage is carried to the Dnieper by numerous small streams. The climate is mild, equable, and in general healthy. The soil is almost all remarkably fertile, producing abundant crops of all kinds of grain, particularly wheat of excellent quality. Beets and tobacco are important

VOLITION—VOLTA

crops. There are also considerable manufactures. Pop. (1897) 2,997,902.

Volition. See **WILL**.

Volkman, fölk'män, Alfred Wilhelm, German physiologist: b. Leipsic, Germany, 1 June 1801; d. Halle, Germany, 21 April 1877. He was educated in Leipsic, London, and Paris, was appointed professor of physiology at Dorpat in 1837 and in 1843 accepted the chair of physiology and anatomy at the University of Halle. He made a specialty of the study of the nervous and optic systems. His writings include: 'Anatomy of Animals' (1831-3); 'The Independence of the Sympathetic System of Nerves' (1842); 'Elasticity of Muscles' (1856); 'Physiological Researches in the Department of Optics' (1863-4); etc.

Volkman, Richard von ("RICHARD LEANMAN"), German surgeon and author, son of Alfred Wilhelm Volkman (q.v.): b. Leipsic, Germany, 17 Aug. 1830; d. Jena, Germany, 28 Nov. 1889. He was educated at Halle, Giessen, and Berlin, in 1857-67 was private-docent of surgery at Halle, becoming professor of surgery and chief of the hospital at that university in 1867. He was a surgeon in the army during the wars of 1866 and 1870-1, becoming surgeon-general in the latter war. He was eminent as a lecturer, made many important investigations in surgery and pathology, and was among the pioneers in introducing the surgical methods of Lister into Germany. He wrote: 'Traumereien au französischen Kaminen Märchen' (1871; 24th ed. 1894); 'Aus der Burschezeit' (1876); 'Gedichte' (1877); while among his professional writings are: 'Beiträge zur Chirurgie' (1875); 'Be merkungen über einige vom Krebs zu trennende Geschwülste' (1898); etc.

Villon, vò-lòd, Antoine, French painter: b. Lyons 20 April 1833. He studied at Lyons and Paris, and exhibited for the first time at the Salon in 1864. At the following year's exhibition he received a medal, also at the salons of 1868 and 1869. He is remarkable for his technique and although he paints figures and landscapes is pre-eminent in the delineation of still-life—a long neglected branch of art. Among his pictures of this kind are: 'Armor'; 'Curiosities'; 'Sea Fish'; and 'The Pumpkin,' this last being in the collection of William Schau, New York.

Volney, vòl'nè (Fr. vòl-nà), Constantin François de Chassebœuf, Comte de, French author: b. Craon, Anjou, 3 Feb. 1757; d. Paris 25 April 1820. He traveled in Egypt and Syria, and urged upon France the conquest of the former in his 'Considérations sur la Guerre Actuelle des Turcs avec les Russes' (1788). Elected to the National Assembly in 1789, he was imprisoned for opposition to the Terror, and on his release made a tour of the United States, described in 'Tableau du Climat et du Sol des Etats-Unis d'Amérique' (1803). After his return he became senator. His best known work is 'Le Ruines ou Méditations sur les Révolutions des Empires' (1791), a vision of a historico-philosophic sort, in which, near the ruins of Palmyra, representatives of all civilizations and faiths pass by and are reviewed. Consult Berger, 'Etudes sur Volney' (1832); Barni, 'Les Moralistes Français' (1873).

Vologda, vò-lòg-da, Russia, (1) a town, capital of the government of the same name, on the Vologda, in the southwest of the government, in a beautiful district extensively occupied with gardens, 35 miles east-southeast of Saint Petersburg. It consists chiefly of old wooden houses; with a few stone buildings in the modern style in the chief square, and has manufactures of linen, soap, candles, glass, leather, etc. Pop. about 30,000. (2) The government of Vologda in the northeast of Russia, is bounded north by the government of Archangel; east by the Ural Mountains; south by Perm, Viatka, Kostroma, and Yaroslaf; and west by Novgorod and Olonetz; area, 155,498 square miles. The surface consists generally of a plateau covered with woods, lakes, and morasses. The drainage mostly belongs to the basin of the Northern Ocean. The great wealth of the government consists in its forests, which furnish timber and charcoal.

Volsci, vòl'sè, an ancient Italian tribe dwelling in Latium, on both sides of the river Liris (Garigliano). They had a republican government. Their principal city was Corioli, from which Coriolanus derived his surname. After having several times endangered the Roman state, they were conquered and absorbed in the Romans, and thus disappeared from history as a distinct people, like the other tribes of Latium (338 a.c.).

Volok, vòl'sk, or Voljak, Russia, a town in the province of Saratov; on the Volga; 80 miles northeast of Saratov. It has a technical school, normal school, etc., ironworks, and tanneries. Large quays extend along the river, and trade in tallow and skins with Saint Petersburg, in fruit with Nijni Novgorod, and in corn with Astrakhan and Rybinsk, is carried on. A great market is held in autumn.

Volsunga, vòl'soongs, a heroic race celebrated in old German legend. Volsung or Walsung, the grandson of Odin, stands forth as the original ancestor. The most interesting and romantic figure in this line of heroes is Volsung's son, Siegmund. Sigfried or Sigurd, hero of the 'Nibelungenlied,' is of the same race. The old Icelandic Volsungaaga, which has been followed by William Morris in his 'Story of Sigurd the Volsung' contains the original legend.

Volt. See **ELECTRICITY; VOLTA, ALESSANDRO.**

Volta, vòl'tà, Alessandro, Italian physicist: b. Como 18 Feb. 1745; d. there 5 March 1827. In 1777 he paid a visit to Switzerland, where he became personally acquainted with Haller at Bern, Voltaire at Ferney, and De Saussure at Geneva. Two treatises, published in 1769 and 1771, in which he gave a description of a new electrical machine, laid the foundation of his fame. In 1774 Volta became rector of the gymnasium in Como and professor of physics. In 1779 he was transferred from Como to Pavia to fill the chair of natural philosophy in the university of that city. Here he occupied himself entirely with electrical researches. He had previously (1777) invented the electrophorus (q.v.), and his invention of the electroscope (q.v.) (also 1777), was an important improvement. His observations upon the bubbles which arise from stagnant water led him also to some valuable discoveries in regard to gases. The electrical pistol, the eudiometer, the lamp with

inflammable air, the electrical condenser, and other inventions, are among his claims to renown. He next turned his attention to some of the atmospheric phenomena, such as the nature of hail, and subsequently increased his reputation by the invention of the Voltaic pile (1800). In 1782 he had made a tour through France, Germany, England, and Holland. In 1794 he received the Copleian medal from the Royal Society of London, for his paper upon the condenser; and in 1801 his electric apparatus attracted so much notice in France that Napoleon invited him to give an account of his invention before a commission of the Institute, and when the commissioners made their report, proposed that a gold medal should be awarded the inventor in recognition of his services to science. He was also decorated with the cross of the Legion of Honor and the order of the Iron Crown, and was raised to the dignity of senator of Italy, with the title of count. In 1804 he resigned his professional duties. Antinori edited a collection of his works (1816). Consult Mochetti, 'Vita del Conte Volta' (1838).

Volta, West Africa, a river of Upper Guinea, which, rising in the Kong Mountains or highlands behind the Ashanti country, runs south between Ashanti and Dahomey, and reaches the Bight of Benin through the east part of the British Gold Coast at Adda. To left and right of its mouth it forms great lagoons, and on the bar across the mouth a heavy surf runs. With its chief tributary the Black Volta its total length is about 850 miles, 250 of which are navigable in the flood season.

Voltaic Batteries. See PRIMARY BATTERIES.

Voltaic Cell. See PRIMARY BATTERIES.

Voltaic Pile, in electricity, an arrangement in a pile of alternate disks of copper and zinc separated by pieces of flannel moistened with salt water or with water acidulated with sulphuric acid. The voltaic pile gives a very small current; but, its circuit being broken, it shows at its extremities electricity of high tension, and it is capable of sending a current through considerable resistances.

Voltaire, *vôl-târ*, Jean François Marie Arouet, French man of letters: b. Paris 21 Nov. 1694; d. there 30 May 1778. He was destined for the legal profession, but his inclination for literature was so decided that he never seriously entered upon it, and the success of his first tragedy 'Œdipe' brought out in 1718, decided him. It is traditionally recorded that this play was finished, and that two cantos of his 'Henriade' were written in the Bastille, where he was confined (May 1717, to April 1718), on account of certain satirical verses on the regent, the authorship of which was ascribed to him. The success of his tragedy at once made him the fashionable poet of the day, and for the next eight years he resided mainly at Paris. It was about the beginning of this period that he changed his paternal name of Arouet into Voltaire, which latter name is most probably explained as an anagram of Arouet l. j. (le jeune — the younger, he having an elder brother). Voltaire suffered a second imprisonment in the Bastille in 1726, the occasion of which was his sending a challenge to the Chevalier Rohan, by whom he had been insulted. This imprisonment lasted but a month, and on being liberated

Voltaire determined to seek greater liberty in England, whither he had been invited by Lord Bolingbroke. His residence in England lasted till 1729, and during it he acquired a certain knowledge of English literature (Shakespeare, Pope, Swift, Addison), and made himself acquainted with the writings of the English free-thinkers, Toland, Tindal, Collins, Shaftesbury, and others. After his return he lived chiefly at Paris till 1734. In the course of this second Parisian residence he raised himself from very moderate circumstances to a condition of affluence, not, however, by literary labor, but by monetary enterprises in connection with a government lottery, the corn-trade, and army contracts. From 1734 to 1749 his principal place of residence was at Cirey, in Lorraine, where he lived with the Marchioness du Châtelet, with whom he had become intimate in July 1733. The death of the marchioness in 1749 deprived him of this retreat, and in the following year he accepted the often repeated invitation of Frederick the Great to come and live at his court at Potsdam. Here he was received with the greatest honor, but the good understanding between him and the king did not last long, and in 1753, after numerous unpleasant scenes, Voltaire quitted the Prussian court. Before returning to France he visited one or two of the minor courts of Germany. At Frankfort Frederick caused him to be detained in order to recover from him a collection of poems by the king containing a number of satires on several princes, some of which Voltaire had maliciously exhibited at the courts he had visited. Early in 1755 he removed to Geneva, and for the remainder of his life lived mainly either in Switzerland or close to its borders. About 1758 he fixed his residence with his niece, Madame Denis at Ferney, in the Pays de Gex, a district that at one time belonged to the counts of Geneva, and from this time this was his sole place of abode. Under his care the village of Ferney, which in 1758, when the estate in which it lies was acquired by him, contained only 49 peasants in a miserably poor condition, became a thriving place, and in 1776 numbered 1,200 inhabitants, among whom Voltaire lived almost as a sovereign prince. In this retirement he became known to all Europe as the patriarch of Ferney, and received a constant succession of visits from persons of rank and fame, and kept up an immense correspondence, which included in its range most of the crowned heads of Europe. In February 1778, impelled, no doubt, chiefly by the desire of hearing once more the applause of multitudes, he went up to Paris, where he was hailed by all classes with boundless enthusiasm. But the sudden change in his manner of life had an injurious effect upon his health, and there can be little doubt that his death was hastened by the excitement of the occasion. He was buried at the Abbey of Scellières, between Nogent and Troyes, of which his nephew, the Abbé Mignot, was commendator. At the revolution his remains were transferred to the Panthéon (1791).

During his whole life Voltaire was an indefatigable writer. The long list of his productions embraces works in almost every branch of literature: in poetry, the drama, romance, history, philosophy, criticism, and even science. Nearly all his works are strongly animated by a spirit of hostility to the Christian religion and its

representatives. This brought him into conflict with the religious element and the government, and a great part of his later years was spent in exile on account of his extreme and rabid criticism of religious thought and belief. It was mainly in order to be out of reach of the government that he lived so much at a distance from Paris on the frontiers of France, whence he could easily make his escape for a while, when he thought it advisable, into Holland or Switzerland. At Cirey and Ferney he could be more outspoken than he had dared to be when he lived chiefly at Paris. From Ferney he issued all his most direct attacks upon Christianity and Catholicism, the 'Sermon des Cinqante,' 'Extrait des Sentiments de Jean Meslier,' 'La Bible enfin Expliquée.' At the same time he was a chief contributor to the 'Encyclopédie,' and indeed its leading spirit. Yet he had no sympathy with the atheistical views that are found expressed in some parts of that work. He upheld theism with as much zeal as he denounced Christianity and priestcraft, and even came to be looked upon as reactionary by the atheistical spirit of the time. It ought to be mentioned also that his hatred of fanaticism, although often the cause of violence and injustice on his part, was the mainspring of some of the most honorable actions of his life, as in the case of the Calas family. (See CALAS, JEAN.)

The works of Voltaire on which his literary fame is now generally held mainly to rest, are his philosophical novels such as 'Zadig,' 'Candide,' 'L'Ingénu'; his histories ('Siècle de Louis XIV.,' 'Histoire de Charles XII.'). his correspondence, and more than all, perhaps, his poetical epistles, satires, and occasional poems of a light character, in which the typical Frenchman is exhibited in his most complete manifestation, full of wit, gaiety, vivacity, ease, and grace. Several of his tragedies, among which may be mentioned 'Zaïre' (usually reckoned his masterpiece in the dramatic art), 'Alzire,' 'Mérope,' 'Mahomet' (translated into German by Goethe), and 'Rome Sauvée,' had great success in their own day, but the French do not assign to them a high place in their literature. Voltaire attempted comedy also, but in this he was still less successful. He seems to have been almost entirely deficient in the comic faculty. The best of his comedies is 'L'Enfant Prodigue.' We should not omit to mention that Voltaire was always a great lover of the drama, and that wherever he settled for any length of time one of his first aims was to get a theatre established in the place, sometimes in his own house. Occasionally he acted himself. The 'Henriade,' an epic poem, with Henry IV. of France, as hero, is another work of his, which, though not highly esteemed now, had great success, and exercised a powerful influence when it first appeared. Of the numerous editions of the works of Voltaire, the best are those of Beaumarchais, with introductions and notes by Condorcet (1784-90), Beuchot (1828 et seq.), and Moland (1877-85). The chief biographies are those by Desnoiresterres, 'Voltaire et la Société Française au XVIII. Siècle' (2d ed. 1887); Mahrenholtz, 'Voltaire's Leben und Werke' (1885); Parton, 'Life of Voltaire' (1881); Hamley, 'Voltaire' (1877); Ballantyne, 'Voltaire's Visit to England' (1893); and Espinasse, 'Voltaire' (1892). Consult also D. Strauss

'Voltaire: Sechs Vorträge' (1870); John Morley, 'Voltaire' (1872); Maugras, 'Voltaire et Jean Jacques Rousseau' (1886); Rabaud, 'Etudes Historiques sur l'Avènement de la Tolérance' (1892); Campardon, 'Documents Inédits sur Voltaire' (1893); Deschanel, 'Le Théâtre de Voltaire' (1886); Lion, 'Les Tragedies et les Théories Dramatiques de Voltaire' (1896); Lounsbury, 'Shakespeare and Voltaire' (1902); Calmettes, 'Choiseul et Voltaire' (1902).

Vol'taism, in physics, a term applied to galvanism, from the fact that Volta's explanations of Galvani's experiments on frogs led to the correct appreciation of the sources of the electricity so generated.

Voltam'eter, in electricity, an arrangement which shows the quantity of electric current which is passing through its circuit in terms of a quantity of water decomposed. The figure shows the voltameter to the left connected with a battery. A circular vessel has two wires let through its bottom, which bear inside two pieces of platinum foil as shown; water slightly acidulated with sulphuric acid is poured into the vessel, and two tubes which have been filled with

Voltameter.

water are placed one over each strip of platinum or electrode. On the poles of the battery being connected with the exterior ends of the wires by means of binding-screws, water will be decomposed, and hydrogen will appear in one tube and oxygen in the other. It will be found, as represented in the figure, that more than twice the quantity of water is displaced in the hydrogen tube than in the oxygen tube. Two volumes exactly of hydrogen and one volume of oxygen are the proper proportions to form water; but some of the liberated oxygen is dissolved by the water.

Volterra, vól-tër-rā, Daniele da (RICCIARELLI, DANIELE) Italian painter: b. Volterra, Italy, 1509; d. Rome 4 April 1566. He studied painting at Siena, and afterward went to Rome, where he gained the friendship of Michelangelo, who not only instructed him, but gave him designs for some of his works. His fame rests chiefly on a series of frescoes in the Church of La Trinità de' Monti, Rome; and of these the 'Descent from the Cross' is well known by Toschi's engraving. He was employed by Paul IV. to drape the figures in Michelangelo's 'Last Judgment' and thus earned for himself the

soubriquet of "Il Braghettono" (The Breeches-maker). In the latter part of his life he applied himself also to sculpture.

Volturmo, vól-too'r'nò, Italy, a river which rises in the province of Campobasso, flows southeast to its junction with the Calore, and then west past Capua into the Mediterranean, 20 miles southeast of Gaeta, after a course of 112 miles. Garibaldi won a victory over the army of the king of Naples on its banks in 1860.

Volume, the bulk occupied by a body. The volume of a body may be "real" or "apparent"; the real volume being the space occupied by the actual substance of which the body is composed, after making allowance for the pores or interstices that may be present; while the apparent volume is the space included within an imaginary surface which just takes in the body, interstices and all. The "apparent volume" of a heap of coal, for example, includes the "real volume" of each separate fragment of the coal, and also the empty spaces between these fragments, as they lie in the pile. See **MENSURATION**; **WEIGHTS AND MEASURES**; **METRIC SYSTEM**; **UNITS**.

Volume, Molecular or Specific, a value obtained as the quotient of the molecular weight of a compound body divided by its specific gravity.

Volumetric Analysis. See **CHEMICAL ANALYSIS**.

Volumometer, an instrument for determining the specific gravity of a solid by measuring the amount of water or other liquid displaced by it. A simple form is a flask having a long narrow neck, and an opening at the side through which the solid may be introduced. The neck is graduated from the bottom upward. The method of using it is as follows: The flask is filled to the zero mark with some fluid in which the solid is not soluble; on turning it on its side the stopper can be removed and the solid introduced; when turned back to an upright posture again the liquid is forced up the stem and the volume reading is the amount of liquid displaced by the solid. From this the specific gravity can be easily calculated.

Voluntary Controversy, a controversy begun in Scotland in 1780, and which continued obscurely until 1831, when it began to excite general interest, resulting at length in disruption of the Scottish Presbyterian Church, and to that remarkable action, by which, as a protest against state interference, on Tuesday, 23 May 1843, 396 ministers and professors renounced all claim to the benefices they had held in connection with the Establishment, declaring them to be vacant and consenting that they should be dealt with as such. By this memorable act of self-sacrifice in obedience to principle these ministers and teachers gave up an annual income amounting to at least \$500,000. See **FREE CHURCH**.

Voluntaryism, or The Voluntary System, a term applied to the support of ministers of religion and their churches by the voluntary contributions of the people, as opposed to the connection of church and state, and the support of the ministry from tithes or general taxation. Whenever the clergy receive stipends from the state, it is evident that the taxpayer, in addition to the voluntary support, if any, which he gives to some particular church, contributes through

taxation to the support of an established church, or of state-recognized churches in general.

In ancient times state and church were inseparable, and opposition to the church was regarded as treason to the state. This relation existed throughout the Middle Ages, and until a comparatively recent period, under the papacy, with the important difference that the state was regarded and treated as subordinate to the church, and as bound to obey its decrees. In the countries which accepted the Protestant doctrines in one form or another the relations of church and state were reversed, and the state, as represented by the sovereign, assumed control of the church, a fact which had much to do with the spread of the Reformation. While the conditions of the connection were changed, however, the tie between church and state became, in Protestant countries, even stronger than before, an ever-present and jealous monarch uniting in his own person the hereditary civil power of the crown, and the religious authority which had formerly been exercised by a distant pope. Dissenters from the established church became rebels, whereas before they had only been heretics, and the devastating civil wars of the 16th and 17th centuries were the outcome, in a large, if not a principal degree, of this new relation.

The dissenter from a church establishment did not seek to put a voluntary system in its place. If he triumphed in England or immigrated to America his aim was to create an established church of his own, and doom to stake or scaffold any intruder who disagreed with him. The colonies of Rhode Island and Maryland, the former founded by Protestants, the latter by Roman Catholics, were framed on the plan, then novel to the world, of toleration in matters of conscience, accompanied by its correlate, the voluntary system.

While the world has made admirable progress toward complete liberty of conscience, while the prison and scaffold no longer menace dissenters from an established creed, and men can be friends, and acknowledge each other's good qualities although differing pole-wide—to use Whittier's expression—in religious opinions, the voluntary system is still almost confined to the United States, Mexico, and the leading British colonies. State-supported churches are the rule, even in France and Germany, where all creeds are on an equal footing; in Switzerland, where absolute liberty of conscience is decreed by law, the magistrates keep a certain degree of supervision over religion, and Brazil, while providing in her constitution for absolute separation of Church and State, still supports the ecclesiastics who were in receipt of state support when the new relation came into force.

In the United States, saving the fact that church property is usually exempt from taxation, the voluntary system prevails everywhere, and only chaplains in the army and navy, and those who say prayers before public bodies, as at the opening of the United States Senate, receive pay from the public treasury. This universal voluntaryism did not come about with independence, or even with the adoption of the Federal Constitution. The first amendment to the Constitution of the United States provided that Congress should make no law respecting an establishment of religion, or prohibiting the free exercise

VOLUNTEERS—VOMITING

thereof. This, of course, did not affect the power of the several States to create or continue church establishments. The convention which framed a constitution for Massachusetts provided in the "Bill of Rights," that "the legislature shall authorize and require the several towns, parishes and precincts to make suitable provision at their own expense for the institution of the public worship of God, and the support and maintenance of public Protestant teachers of piety, religion and morality, in all cases where such provision shall not be made voluntarily." Officers known as tithingmen were appointed to collect the dues, and if a taxpayer defaulted, distress and even imprisonment followed. This system amounted to state support of the Congregational Church, and it was not until 1815 that dissenters from the prevailing creed were released from paying taxes to maintain the ministers of the majority. The involuntary system was abolished altogether in Massachusetts in 1833. In Connecticut the Constitution of 1818, while giving every society of Christians power to tax the members of such society, permitted any member to escape this obligation by giving notice of withdrawal in writing. And now, as for many years past, without any provision of the Federal Constitution to coerce the States, and by force of enlightened public opinion, voluntarism in the maintenance of ministers and churches prevails everywhere throughout the republic, and in no country in the world is religion better supported, while the clergy also, conscious of their freedom from state control, are self-respecting in their personal attitude, and devoted to the service of God and of their flocks.

Volunteers, a name applied to the citizens of a state or nation who of their own accord offer their services in a military capacity without the stipulation of a substantial reward. In all the American wars from the Revolution to the Spanish-American war, there were volunteer soldiers, companies and regiments. These were generally amalgamated with regular troops when it was found their services were available. In Great Britain in 1794 and again in 1803, when the threats of France agitated England, nearly the whole of the available male population was formed into volunteer companies, and the government at one time reckoned upon having nearly 500,000 efficient volunteers in arms. The numbers soon declined, and in 1815 the force almost ceased to exist. About 1857 a feeling of insecurity began to manifest itself in consequence of the alleged insufficiency of the national defenses, and the Victoria Rifles in London and one or two other corps were formed. In a short time the movement began to spread; in May 1859, the formation of volunteer corps of riflemen commenced under the auspices of government, and by the end of the year many thousands were enrolled. After four years' preliminary experience an act of Parliament relating to the force was passed in 1863; another was passed in 1869, and these, with subsequent acts and regulations, constitute the law relating to volunteers. The Volunteer Acts of 1866 and 1900 regulate offers by volunteers for actual military service outside Great Britain; and in the South African War a number of volunteers took part with great credit to themselves. There are also considerable numbers of volunteers in India, Canada, Australia, etc.

Volunteers of America, The, a religious body organized from former members of the Salvation Army (q.v.) in 1896 by Commander and Mrs. Ballington Booth and consisting of six regiments, embracing nine companies or central societies and nearly 100 self-supporting posts, not including outposts. The head officer is elected by the members as commander-in-chief, and by the directors as president. There are four branches of philanthropic work: (1) The sociological branch, which provides homes for destitute men. In 1903 the 10 homes located in various cities furnished lodging for 200,000 persons. (2) The Home of Mercy, branch for friendless young women maintaining one home in Newark, N. J., and one in Boston, Mass. (3) The tenement work for the worthy poor. (4) The philanthropic branch, working among unprotected children. The Prison League is an important department of volunteer activity. In 1910 there were branches in 20 States, embracing 7,500 prisoners and corresponding with 19,000 men. There is an aggregate annual attendance of 1,500,000 persons at the hall meetings and 2,000,000 at the open air meetings.

Volutes, *Florientum*. See **WILSON, FLORENCE**.

Volute, a spiral scroll used in Ionic, Corinthian, and Composite capitals, of which it is a principal ornament. The number of volutes in the Ionic order is four. In the Corinthian and Composite orders they are more numerous, in the former being accompanied by smaller ones, called helices; called also *voluta*. See **ARCHITECTURE**.

Volute Wheel, a volute shaped wheel that in revolving presents its open mouth to the air, which is thus gathered into the tube and discharged through the hollow axis. It is a common and effective sort of blower. Also, a water-wheel with radial or curved buckets, in which the periphery of the wheel is surrounded by a volute-shaped casing or scroll.

Volvox, a minute aquatic plant (*Volvox globator*), in the form of a pale green globule floating about in the water. Under the microscope it is seen to be a spherical membranous sac, studded with innumerable green points giving exit to cilia, which enable it to roll over and over in the water. Within the sac are various dense globules, generally green in summer, but often of an orange color in autumn and early winter. They are zoospore-like bodies, each sending a pair of cilia through separate orifices. There is a reddish brown spot and a contractile vacuole.

Vo'mer, one of the bones of the skull. See **HEAD; SKULL**.

Vomiting, the ejection of matter from the stomach through the mouth, mainly by spasmodic contraction of the abdominal muscles, assisted by the active co-operation of the muscular walls of the organ; the diaphragm remains fixed, affording a firm surface against which the stomach is pressed by the abdominal muscles. Relaxation of the sphincter at the cardiac orifice of the stomach is necessary, as its contraction will resist the power of all the expulsores muscles combined, explaining the violent and vain efforts to vomit so commonly seen and experienced; the act is preceded by a deep inspiration, the glottis being spasmodically closed during the paroxysm.

VONDEL — VOORSANGER

It may be produced by irritating substances applied to the mucous membrane of the stomach, the impression being conveyed by the pneumogastric nerves and the motor nerves of expiration, as in common emetics, by irritations in other parts of the body, transmitted by reflex nervous action, as in strangulated hernia, the passage of calculi, and during gestation; and by impressions received through the sensorial centres, whether emotional or sensational, as from tickling the fauces, disgusting sights or odors, and in seasickness; even the recollection of these sensations may cause vomiting in very impressionable persons. It is a common symptom of many diseases of the stomach and intestines, and arises from sympathy in affections of many other organs; it is sometimes nervous or spasmodic. Exclusive of the treatment proper for the special disease of which it may be the symptom, effective remedies for vomiting are ice, effervescing potions, mercurials, prussic acid and various narcotics, creosote, chloroform, and ether. In many birds and some mammals, the contents of the stomach are ejected as a means of offense, as in the petrels and vultures, and the llama. Vomiting is usually more easily induced in children than in adults. It is a frequent accompaniment of pregnancy (see OBSTETRICS), and is often prominent in disease of the kidneys (q.v.), tuberculosis (q.v.), etc. Vomiting is in many cases entirely salutary, and in such cases is to be encouraged and assisted.

Vondel, von'del, Joost van den, Dutch dramatic poet: b. Cologne 17 Nov. 1587; d. Amsterdam 5 Feb. 1679. His parents, who were Anabaptists, removed to Holland while he was a child, and the poet afterward adopted the Arminian faith, but finally died in the bosom of the Roman Catholic Church. Nature had endowed him with extraordinary talents, and he derived little aid from education. Devoting himself entirely to the cultivation of Dutch poetry, Vondel first learned Latin and French in the 30th year of his age. His works display genius and elevated imagination, and embrace lyric and didactic poems, satires, an epic, and some 30 tragedies, some of which are founded on biblical subjects and bear such titles as 'Lucifer,' 'Noah,' 'Jephtha,' etc. These enjoy a high reputation in Holland, and the interspersed choruses may be regarded as the finest lyrical productions of the Dutch muse. The best collective editions of his works are those by Jan van Lennep (1850-69) and Unger (1890 onward). The dramatic poem 'Lucifer' (1654) is his greatest work and by some critics is supposed to be the source of the inspiration of Milton's 'Paradise Lost,' but this may reasonably be doubted. English translations of Vondel's 'Lucifer' (1898); 'Samson' (1903); and 'Adam' (1903) have been made by C. Van Noppen (q.v.). Consult 'Lives' by Baumgartner (1882); Haek (1890); Looten, 'Etude littéraire sur Vondel' (1889); Müller, 'Ueber Miltons Abhängigkeit' (1891).

Von Holst, fön hölst, Hermann Eduard. See HOLST, HERMANN EDUARD.

Von Mannlicher, fön män'tlic-ër, Ferdinand. See MANNLICHER, FERDINAND VON.

Von'noh, Robert William, American artist: b. Hartford, Conn., 17 Sept. 1858. He studied at the Massachusetts Normal Art School, Boston, 1875-9; was instructor there in painting

and drawing, 1879-81; in 1881-3, and again from 1886 to 1891, studied in Paris, teaching in the interval at the Museum of Fine Arts, Boston. He acquired a manner in which realism and impressionism are emphasized by dramatic effects and boldness of treatment in light, color, etc. Whether in portrait, figure, or landscape painting, his work has individuality and interest, and his success particularly as a portrait-painter has been marked. From 1891 to 1896 he was principal instructor in portrait and figure painting at the Pennsylvania Academy of the Fine Arts. He has exhibited much in this country and in Europe. Among his works are: 'Sad News'; 'Miss Mildred Blair'; 'Little Louise'; etc.

Voodoo'. See Voodoo.

Voorhees, voor'ez, Daniel Wolsey, American legislator: b. Liberty, Ohio, 26 Sept. 1827; d. Washington, D. C., 10 April 1897. He was graduated from Indiana Asbury (now De Pauw) University in 1849, admitted to the bar in 1851, and engaged in law practice at Covington, Ind. In 1858-61 he was United States district attorney for Indiana, and he was attorney for the defense of John E. Cook during the latter's trial for participation in John Brown's raid. He was member of Congress in 1861-6 and in 1869-71, and from 1877 to a few months before his death, United States senator from Indiana. He was a member of the finance committee throughout his entire career in the Senate, and an advocate of the free and unlimited coinage of silver until 1893 when he cast his vote to repeal the silver-purchase clause of the Sherman act. He was largely instrumental in securing the erection of the Congressional Library building, and was noted as an orator.

Voorhees, Philip Falkerson, American naval officer: b. New Brunswick, N. J., 1798; d. Annapolis, Md., 26 Feb. 1862. He was appointed midshipman in the navy in 1820, served in the War of 1812, participated in the capture of the Macedonian and the Epervier, and received a Congressional medal of honor for his services. He attained rank as captain in 1838 and was assigned to command the Congress, in which capacity he captured, in 1844, an Argentine squadron and an allied cruiser which had fired on an American ship. His action was commended in home and foreign diplomatic circles, but he was tried by court-martial. His course was vindicated and in 1847 he was assigned to command the East Indian squadron, a position equal to the rank of rear-admiral, which had not then been established in the United States navy. He was placed on the reserve list in 1855, an action against which he appealed to President Buchanan as unjust. A decision favorable to Voorhees was rendered by Attorney-general Black and he was restored to the leave pay-list.

Voorsanger, foor'sáng'ër, Jacob, American rabbi and educator: b. Amsterdam, Holland, 13 Nov. 1852. Taught at the theological seminary of his native city, he came to the United States about 1870, and was rabbi at Philadelphia (1873-6), Washington, D. C. (1876-7), Providence, R. I. (1877-8), and Houston, Texas (1878-86). Since 1886 he has been rabbi of Temple Emanu El, San Francisco, Cal. He edited 'The Sabbath Visitor' for three years,

besides making numerous contributions to leading Jewish weeklies. In 1884 he was elected professor of Semitic languages at the University of California. He has written: 'Moses Mendelssohn, Life and Works'; 'Chronicles of Emanu El.' He founded in 1895 a weekly, 'Emanu El,' which he continues to edit.

Voronezh, vó-ró-nězh, Russia, (1) The capital of a government of same name, on a height above the Voronezh, near its confluence with the Don, 290 miles south-southeast of Moscow. It consists of a high town, a low town, and three extensive suburbs — is well built, and has a cathedral, an episcopal palace, town-house, gymnasium, diocesan seminary, arsenal, hospital, and poorhouse; manufactures of woolen and linen cloth, soap, and vitriol, numerous tanneries, a considerable trade in corn and tallow, and important fairs and markets. Voronezh has interesting associations of Peter the Great, and of the poets Nikitin and Koltsoff. Pop. about 90,000. (2) The southern government of Voronezh has an area of 25,443 square miles. It is intersected by the Don, which receives the whole of the drainage, partly through its tributaries, the Voronezh and Khoper. The soil is generally fertile, and large crops of grain are raised. The breeding of horses and sheep is an important industry. Manufactures are considerable, and there is an extensive trade. Pop. about 2,700,000.

Vörösmarty, vé-rěsh-márt-y, Michael, Hungarian poet; b. Nyék, comitat of Stuhlweissenburg, 1 Dec. 1800; d. Budapest 19 Nov. 1855. He studied in Pest, practised for a time as an advocate, in 1848 was a member of the National Assembly, and was twice imprisoned for political reasons by the Austrian government. A memorial to him was placed at Stuhlweissenburg in 1866. Among his poems and dramas were: 'King Solomon' (1821); 'The Victory of Faithfulness' (1823); 'Zalán's Flight' (1825); 'Csérholom' (1826); 'Erlau' (1828); 'Csongor and Tünde' (1831); 'Barnus Mardó' (1838). Gyulai prepared a collective edition (1864; 2d ed. 1884) and a biography (1864; 4th ed. 1896).

Vorse, Albert White, American editor b. Littleton, Mass., 18 Aug. 1866. He was graduated from Harvard in 1889, was connected with the Philadelphia Press 1891-3, the New York Mail and Express 1894-6, and subsequently with the 'Illustrated American' and the 'Criterion' 1899-1901. He has published 'The Laughter of the Sphinx' (1900).

Vortex, a whirlpool or eddy; any fluid rotating around an axis. The name is applied to pools, waterspouts, whirlwinds, and on a larger scale in cyclones and storms generally. Descartes supposed certain vortices to exist in the ether of space endowed with a rapid rotatory motion and filling all space, and by these he accounted for the motions of the universe.

Vortex Atom. See VORTEX MOTION.

Vortex Motion. The motion of a mass of fluid (including under this term gases and liquids) is known if the motion of every infinitesimal portion, or particle, of the mass is known. The motion of a particle is investigated by referring the successive positions it occupies in its journey to a set of three straight lines, or axes, which pass through the same point and are mutually rectangular. With respect to these

axes the motion of the particle may assume either one of two characteristic types. It may move without rotation about either of the axes, or it may move with rotation about one or more of the axes. The former type is called irrotational motion, and the latter type is called rotational motion, or vortex motion. The vortex type of motion is by far the more common in nature and manifests itself in an infinite variety of ways. One of the most striking examples of vortex motion is seen in smoke rings emitted occasionally by locomotives and other high pressure steam-engines when exhausting slowly. Similar and more definite rings are easily produced also by devices now common in physical laboratories. Helmholtz, who was the first to investigate the theory of vortex motion, showed that vortex rings and filaments, or combinations thereof, in a perfect liquid (which is an ideal frictionless fluid of constant density) are indestructible. Extending this idea to perfect fluids, Lord Kelvin has imagined that the atoms and molecules of physical science may be vortex rings or filaments, or combinations thereof, in the ether. For the theory of vortex motion and references to the literature of the subject, consult Lamb, 'Hydrodynamica.'

Vortex Ring. See VORTEX MOTION.

Vorticella, vór-ti-sél's, a family (*Vorticellidae*) of attached or free forms of peritrichous ciliates, in which the adoral zone of cilia, where seen from above, forms a right spiral (dextro-tropic), while a secondary circlet of cilia near the aboral end may be either permanent or transient. The true vorticellids, represented well by the common bell-animalcule, are without a permanent second circle of cilia, and the peristome may be completely included within a peristome fold which contracts sphincter-like about it. The stem is either firm and constant in length, or flexible and capable of being contracted suddenly when it becomes a short close spiral. The individuals also are mounted on a single unbranched stalk or grouped on a common branching stalk in colonial existence. The simplest type of reproduction is longitudinal division, which may result in producing two individuals in a branched stalk, or one of the two may become detached and, propelled by a newly-formed circle of cilia near the basal end, lead a free existence for a time. Soon the free form settles down and develops a stalk. Conjugation has been observed and always takes place between a stalked form and a free-swimming form produced by budding. The bell-animalcule has long been a favorite object of microscopical study from its abundance and easily observed structure and activities. Ehrenberg (1838) made an extensive study of these organisms, and maintained that they possessed the complete organ systems of higher forms. The demonstration of their unicellular nature necessitated the abandonment of this view. The group is rich in number and variety of species.

HENRY A. WARD,
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Vortigern, vór-ti-gěrn, a semi-mythical British king of the 5th century, who, according to Gildas, Bede, Ethelwerd, and the 'Old English Chronicle,' invited Hengist (q.v.) and Horsa to assist him against his enemies the Picts and Scots. Whether invited by Vortigern or not, the newcomers are said to have turned

against him and wrested from him the Kentish territory. There is something like unanimity in the chroniclers regarding Vortigern's character. They make him tyrannical and licentious. It is to be presumed that he came to a violent end in conflict with the invaders who had established themselves in his dominions.

Vos, vds, Geerhardus, American Presbyterian theologian: b. Heerenveen, Holland, 14 March 1862. He was educated at the seminary of the Holland Christian Reformed Church at Amsterdam and at Princeton Seminary, and was professor of theology in the former institution 1888-94, and since the year last named has held a similar post at Princeton. He has published 'The Mosaic Origin of the Pentateuchal Codes' (1886); 'De Verbondsleer in de Gereformeerde Theologie' (1891); etc.

Vos, Maarten de, Flemish painter: b. Antwerp 1532; d. there 1603. He studied in Antwerp under his father, Pieter de Vos, and De Vriendt, and at Venice under Tintoretto, established a school of painting in his native city in 1558 and became one of the most popular artists of his day, hundreds of engravings of his paintings and drawings being made. Among his works are 'The Triumph of Christ'; 'Cæsar's Penny'; 'The Marriage at Cana,' in the cathedral at Antwerp; 'Saint Luke Painting the Portrait of the Virgin.' He is sometimes styled 'the Elder,' in distinction from his son Maarten (b. 1576; d. 1613), also an artist.

Vooges, vdzh, a European chain of mountains about 100 miles long, partly on the frontiers of France and the German territory of Alsace, partly in Alsace, extending from north-northeast to south-southwest, nearly parallel with the Rhine, and forming a continuation of the Jura Mountains, which separate France from Switzerland; the breadth varies from 20 to 45 miles. The highest summit, Ballon-de-Guebwiller (the summits are generally called ballons), has a height of 4,685 feet above the surface of the sea. The Vooges Mountains have a gentle declivity, and on the eastern and southern sides are covered with vineyards. Great part of the Vooges is densely wooded, and, besides abounding in game, they possess great mineral wealth, including silver, copper, iron, lead, coal, and antimony. They also contain excellent pasturage; and the inhabitants breed many cattle. The Ill, Lauter, Moselle, Meurthe, Saar, and Saône rise in this chain of mountains.

Vooges, France, an eastern department bounded on the north by the departments of Meuse and Meurthe, on the east by Alsace, on the south by the departments of Haute-Saône, and on the west by Haute-Marne; area, 2,303 square miles; capital, Epinal. The department derives its name from the mountain-chain which bounds it on the east, and sends out ramifications over the greater part of its surface. Its south portion is traversed east to west by the chain of the Faucilles. In the lower grounds, on an elevated but tolerably flat tract, grain, hemp, flax, and potatoes are extensively raised. The wine produced is indifferent, but the department has long been famous for its kirsch-wasser made from the produce of extensive cherry-plantations. The principal rivers are the Meuse, Mouzon, Madon, Moselle, Saône, and Meurthe; but none of them are navigable within

the department. The minerals include argentiferous lead, copper, iron, antimony, cobalt, marble, millstones, slate, kaolin, and fine agates. The chief manufactures are the famous Gêrome or Munster cheese, cotton and linen cloth, lace, musical instruments, turnery and wooden clogs, nails, iron, steel and iron ware, paper, leather, pottery, and glass.

Voss, fds, Johann Heinrich, German poet and translator: b. Sommersdorf, near Waren, Mecklenburg, 20 Feb. 1751; d. Heidelberg 29 March 1826. He early began to write verses, and some of these contributed to the 'Göttingen Musenalmanach' led to a correspondence with Boie, upon whose invitation he went in 1772 to Göttingen. Here he studied the classical and modern languages, and was one of the founders of the Göttinger Dichterbund. The editorship of the 'Musenalmanach' was handed over to him by Boie in 1775; in 1778 he was made rector of Otterndorf in Hanover, in 1782 at Eutrn. In 1781, after the publication of several treatises, he produced his German 'Odyssey,' a work which has rendered this grand poem national with the Germans (new ed. by Bernays 1881). This has been called 'the most perfect rendering of Homer into a modern tongue.' In 1793 appeared his translation of the 'Iliad,' and that of the 'Odyssey,' in a new form, in which, however, it did not please so much as before, the former displaying greater truth and naturalness. He published in 1795 an idyl in the epic form called 'Luise,' printed first in 1783, but now produced with improvements. His translation of the whole of 'Vergil' (1799) was revised for the edition of 1822. In 1805 he went as professor to Heidelberg, where he remained till his death. Voss rendered good service to the study of classical antiquity, and threw fresh light upon many subjects. As a translator he exhibited wonderful command of language and great skill in the handling of metres. Among his translations that of Homer's works is undoubtedly the greatest; we may also mention, in addition to his 'Vergil,' his 'Hesiod' (1806); 'Horace' (1806); 'Theocritus, Bion and Moschus' (1808); 'Aristophanes' (1821); 'Tibullus' (1820); 'Propertius' (1830); and selections from 'Ovid' (1798). He also undertook, with his sons, a translation of Shakespeare, which was completed in nine vols. in 1820, but this translation cannot stand a comparison with Schlegel's. Consult lives by Paulus (1826); by Herbst (1872-6); Prutz, 'Der Göttinger Dichterbund' (1841).

Vote. See **BALLOT**.

Voting Machine. The wave of ballot reform which swept over the United States of America immediately after the year 1888 firmly established the Australian or blanket ballot as a factor in the elections of practically all of the States of the United States of America. This ballot was intended to encourage freedom of choice on the part of the voters, and while it seemingly makes it easy to split the ticket (or to cast an independent ticket) it oftentimes disfranchises the voter because of his mistake in marking it. The introduction of the Australian ballot opened the way for voting machines and demonstrated the need of them. The voting machine is a mechanical Australian ballot, having for its object the correcting and preventing of the abuses to which the Australian ballot sys-

VOTING MACHINE

tem is susceptible, and expediting the returns; it accords to each voter his full voting privilege, it prevents him from making mistakes that would take his ballot out of compliance with the law, and makes it unnecessary for the judges to inspect the ballot to determine its legality. The machine counts the ballot for each candidate at once, making it a part of the total vote. When a vote is cast, the operating devices are automatically reset and the machine is again ready for operation by another voter. Machines include safeguards against frauds by election officers. They make it more easy for the voter to accomplish his work, and prevent him to a great extent from making a partial or complete failure in voting. The use of them compels secrecy, reduces the amount of labor involved on the part of election boards, secures greater economy in the expenses of election, and gives the returns at once on the closing of the polls.

The Requisites of a Complete and Legal Voting Machine.—A voting machine must enable a voter to cast his vote in secret; that is, so that no one can see or know for whom he has voted.

The method of voting must be simple, and within the comprehension of all classes; so that illiterate or blind persons, after receiving instruction, can vote without assistance.

It must be convenient in its operation.

It must permit a voter to vote for all of the candidates nominated by any party, or to vote in part for the candidates of one party, and in part for the candidates of other parties, and provide for voting for persons who are not nominated by any party, for any office.

It must give the voter perfect freedom in his selection from any of the candidates without regard to their position on the machine. For some offices, but one candidate is to be voted for; for others two or more may be nominated by each party.

It must be beyond the power of the voter to vote for more persons than he is entitled to vote for, or to vote twice.

It must permit a voter to change his vote, or correct a mistake, while he is in the booth.

It must permit a voter to split his electoral vote.

It must permit voting on questions.

It must permit limited or restricted voters (females or others) to exercise their rights under the law, but not to exceed them, either for candidates or questions.

It must count, positively and accurately, every vote cast.

It must prevent defective ballots.

The counters should be so placed, that they can be conveniently examined before and after the election.

All the moving parts should be controlled by locks, so that the register of the vote shown on the counters cannot be changed, thus maintaining a permanent record during the time prescribed by law.

The voting machine must be so constructed that it cannot be unlawfully manipulated by anyone, under conditions that prevail in elections legally conducted.

It must be able to bear the most rigid scrutiny of expert mechanics and others qualified to judge of the merits of such mechanism.

There must be simple and positive action

of the working parts, which must be so related that if misplaced by the voter either by accident or design, no injury will result from the further operation of the machine.

Extent of Use.—The first voting machine built and actually used in an election was the Myers Voting Machine; the invention of Jacob H. Myers; it was used in the election of the town of Lockport, N. Y., in 1892, and attained considerable use elsewhere in that State. This machine was legalized in the State of New York, as well as the States of Connecticut and Michigan. Afterward improved machines began to make their appearance. The inventions of Sylvanus E. Davis and Alfred J. Gillespie resulted in the Standard and U. S. Standard Voting Machines, which have attained the greatest use and perhaps the greatest celebrity in the voting machine art. These machines are used extensively in the States of New York, Connecticut, Wisconsin, Michigan, Indiana, New Jersey, and California. They are the only method of conducting elections in 24 cities and 272 villages in the State of New York. The election for the entire city of Rochester, N. Y., in 1898 was held by 73 of these machines and the election was the first complete and convincing demonstration of the practicability of using voting machines on a large scale.

In Buffalo, N. Y., these machines have been used in the elections since 1899; the returns from all of the 108 election districts with over 60,000 voters have been received and tabulated at the City Hall in 35 minutes, and papers sold on the streets within one hour after the closing of the polls, although the ticket was of considerable size, containing some 150 candidates.

The U. S. Standard Machine.—The U. S. Standard Voting Machine has an upright keyboard, on which the party rows of candidates and keys therefor are arranged in horizontal lines with the lines of the offices transverse thereto. At the end of each party row a lever is provided by means of which all of the keys of that party row may be moved together to a voting position over the names of the candidates nominated by that party; or the keys may be moved separately to a voting position over the names of the candidates for which the voter desires to vote. Before the voter can arrange his ticket he must enter the booth by closing the curtain around him to shield himself from the public, after which he pulls either a party lever for straight ticket voting or a releasing lever, to unlock the keys to enable him to prepare his ballot independently. The machine affords the voter an opportunity to cast a straight party ticket, to split his ticket, to correct mistakes, to vote for candidates not in nomination and gives him all facilities to cast only a legal vote, which is sure to be counted as he indicates. If constitutional amendments or questions are submitted to the people, they can be voted on, provisions being made to vote "yes" or "no" on all such questions or amendments. By opening the curtain the voter counts his vote and sets the machine for the next voter. The total vote for each candidate and question is given at once at the close of the election. The machine is also equipped with lockouts which are operated by the election officers to prevent particular voters from voting for offices or on questions on which they are not entitled to vote.

The machine is provided with a protective counter which counts up to 1,000,000 and cannot be reset, and reliably indicates whether the machine has been operated or changed after it has been prepared for an election, or after the close of an election.

The Abbott Machine.—The Abbott Machine has had some use in the State of Michigan, being legalized by the laws of that State. It has all of the candidates for one office mounted on a slide, which can be adjusted according to the wishes of the voter. He can move the office slides to the right or to the left, so as to bring the name of the candidate desired into line with the operating bar, by the operation of which the vote is registered on counters. The machine is limited, however, in that it cannot group; that is, provide for the voting for two or more candidates on one office line, which is always necessary when two or more candidates are to be elected to an office.

The Bardwell Machine.—The Bardwell Machine, which has been used to a limited extent, has the candidates arranged in office lines and party rows. When the voter enters the booth, he is furnished with a key which he inserts in the key-hole belonging to the candidate he wants to vote for, and turns it half way around. This counts a vote for that candidate and locks the other candidates for the same office from receiving a vote, and by repeating this operation on other office rows the voter is enabled to cast his vote as he desires for the whole ticket. In case he has made a mistake by casting a vote for the wrong candidate, he can withdraw this vote by again inserting the key in its key-hole and turning it backward. Straight party tickets are counted on separate counters, the operation of which, by the voter, locks the balance of the counters against operation, but the total of the counters must be added to the counters of the candidates of that party at the end of the election. CARL F. LOMA,

United States Standard Voting Machine Co.

Voodoo', or Voodoo, a common name applied by the negroes of the West Indies and the United States to certain superstitious rites and beliefs brought originally from Africa. In the Southern States, before the Civil War, voodooism was generally practised among the slaves, and voodoo doctors were common. Many of these doctors were skilful poisoners, and while the great mass of their professed art was a rank imposture, still they possessed enough of devilish skill to render them objects of wholesome dread. Their services were more often invoked in destructive than in curative offices. If a negro desired to destroy an enemy, he sought the aid of the voodoo, who, in many cases, would undertake to remove the obnoxious one, and the removal was generally accomplished through the medium of poison. No doubt exists that in many cases the victim of a voodoo died from sheer fright, for whenever a negro had reason to think that he was possessed by the spell of the voodoo, he at once gave up all hope, thus hastening the accomplishment of the end toward which the energies of the sorcerer were directed. Their incantations and spell workings were always conducted with the greatest secrecy, no one being allowed to witness the more occult and potent portion of their ritual.

VOL. 22—3

Vouet, voo-è, Simon, French painter: b. Paris 9 Jan. 1582; d. there 30 June 1649. At 14 he went to London where he was already able to make a living by his art, and going to Constantinople in 1611 obtained many commissions there. The next year he studied the works of Paul Veronese at Venice and was later made president of the Roman Academy, but was presently recalled to Paris and made court painter by Louis XIII. The progress of French art was much advanced by him, and among noted pupils of his were Lebrun, Lesueur and Mignard.

Vousoir, voo-swâr', an architectural term meaning one of the stones which form the arch of a bridge, vault, etc., and are always cut more or less in the shape of a truncated pyramid or wedge. The under sides of the vousoirs form the intrados or soffit of the arch, and the upper sides the extrados. The middle vousoir is called the keystone of the arch. See ARCHITECTURE.

Vow, a solemn promise made to perform some act, or to follow out some line of conduct, confirmed by an appeal to the Supreme Being, or supernatural power, to favor or to punish the maker of the promise according as he fulfils or breaks such promise. Some vows bind those who make them to perform a certain act out of gratitude for a particular favor, as in the case of Jephthah; others comprehend the performance of certain limited duties during a whole life-time, as the marriage-vow and a sovereign's coronation oath; and others, again, give a particular form to the entire character of a man's life, as the monastic and priestly vows. Among Roman Catholics vows are divided into two kinds: Solemn, those taken in the face of the Church; and simple, those made in private. Bishops are considered to have the power of releasing from simple vows generally; but the power of dispensing in important simple, and in all solemn vows rests with the pope; the vows specially reserved for papal dispensation were: that of absolute and perpetual chastity, entering into a religious order, making a pilgrimage to Rome or Compostella, or of setting out on a crusade. See RELIGIOUS ORDERS.

Vowel (from the French *voyelle*; Latin, *vocalis*), a simple articulated sound, which is produced merely by breathing, accompanied by a constriction in the larynx, a greater or less elevation or depression, expansion, and contraction of the tongue, and contraction or expansion of the lips. The vowel sounds of the English alphabet are imperfectly represented by five letters, *a, e, i, o, u* (and sometimes *w* and *y*); the deficiency of our alphabet may therefore be seen at a glance, when we mention that there are at least 13 distinct shades of vowel-quality in the spoken language as heard in the words *ale, an, ash, ah, all; ell, err; est, ill; old, ore; pull, ooze*. The long sound of *i*, as in *ire*, and of *y*, as in *by*, although represented by one letter, are really compound vowel sounds or diphthongs. The French simple vowel sounds *u* and *eu*, and the German *ö* and *ä*, are not heard in the English language. See the articles under the several letters.

Voyageur, vwo-yä-zhër', a French-Canadian term for traveler. It was specifically applied to a class of men employed by the fur companies in transporting goods by the rivers and

VOYNICH — VULCANIZATION

across the land to and from the remote stations of the Northwest. They were nearly all French Canadians or half-breeds.

Voynich, vo'i'nich, Ethel Lillian Boole, English novelist: b. 1864. She was a daughter of G. Boole (q.v.), and was married to W. M. Voynich, a Polish writer in England. She is the author of 'Russian Humor'; 'Stories from Garshin'; 'The Gadfly,' a very striking story which excited much attention (1897); 'Jack Raymond' (1901).

Voysey, voi'zi, Charles, English theistic clergyman: b. London 18 March 1828. He was graduated from Oxford in 1851, took Anglican orders and was curate of Hesse, Yorkshire, 1852-9, of Creighton, Saint Andrews, Jamaica, 1860-1, and of Saint Marks, Whitechapel, London, 1861, but lost the last position on account of a sermon of his against endless punishment. He was vicar of Healaugh, Yorkshire, 1864-71, but having published in 1865 sermons declared to be opposed to the Bible and the 39 articles, he was prosecuted in the Chancery court and the case being taken to the judicial committee of the Privy Council he was deprived of his living and forced to pay the costs in 1871. He subsequently founded the Theistic Church in Swallow Saint Piccadilly, London, the church being supported by the "Voysey establishment fund." Among his published works are: 'The Sling and the Stone' (1872-93); 'Theism as a Religion of Common Sense' (1894); 'Theism as a Science of Natural Theology and National Religion' (1895); 'Testimony of the Four Gospels concerning Jesus Christ' (1896).

Vredenburg, Edric Walcott, English novelist: b. Para, Brazil, 29 March 1860. He was educated at Tonbridge School, Kent, entered the army and was a lieutenant in an Essex regiment. He has since given his attention to writing novels as well as stories and verse for children. Among his works may be cited: 'The Haunted House in Berkeley Square'; 'A Bitter Inheritance'; 'At the World's Mercy'; 'By the Queen's Command.'

Vreeland, Herbert Harold, American railway president: b. Glen, Montgomery County, N. Y., 28 Oct. 1856. He received a common school education and worked his way upward from a humble position to that of railway president. In 1893 he became president and general manager of the New York Metropolitan Street Railway Company and was prominent in the consolidations which subsequently placed all surface railways on Manhattan Island under one management.

Vriendt, frént, Frans de. See **FRANS**, **FRANS**.

Vriesland, frés'lánt. See **FRIESLAND**.

Vryheid, fri'hid, South Africa, a town of Natal, prior to the South African war, 1899-1902, belonging to the Transvaal Republic. It is about 280 miles north of Durban by the railway through Pietermaritzburg, Ladysmith, and Dundee, in the centre of a district containing coal, gold, and other minerals. It has Dutch Reformed, Anglican, Wesleyan, and other churches, a masonic temple, schools, and mineral springs. The district of Vryheid was ceded to a party of Boers by Dinizulu, a Zulu chief, in 1884, and was constituted a separate state under the title of the

New Republic. In 1888 it was incorporated in the Transvaal. The white population of the district is about 5,800; of the town, 2,400.

Vuillaume, vwé-yôm, Jean Baptiste, French violin maker: b. Mirecourt 7 Oct. 1798; d. Paris 19 Feb. 1875. He settled in Paris in 1818, and imitated the instruments of Stradivarius, the Amatus and Maggini. He came to stand with Lupot at the head of French musical instrument makers of the 19th century. Long journeys were made by him after special kinds of woods, and he was constantly experimenting toward improvements. He received many distinctions. In the Paris Exposition in 1867 he was ranked above competition.

Vulcan, the Roman god of fire and patron of metallic handicrafts; the son of Jupiter and Juno, and identical with the Greek Hephaestus. According to mythology Vulcan was ugly and deformed, and Juno, ashamed to own such a child, dropped him from heaven, when the infant god, falling into the sea, was rescued and adopted by Thetis, who kept him till nine years of age. He was then restored to his parents. Soon after his return to Olympus, Vulcan took his mother's part in one of the quarrels between husband and wife; Jupiter, enraged at Vulcan's audacity, flung him from heaven. The youth alighted on the island of Lemnos, breaking his ankle in the fall; here he raised forges and workshops, and became the chief of artificers. Some poets, however, fix his workshop on Olympus, another on Etna, where Cyclops were his chief assistants. He fashioned Pandora, and had Venus given him for his wife, by whom he was father of Cupid. Vulcan is represented bearded, covered with dust and soot, and toiling hard at his forges.

Vulcan, in astronomy, the name given a planet between the Sun and Mercury. In 1899 M. Lescarbault, a village physician of Orgèze, France, saw a small dark planet-like body pass across the sun's disk. The planet was called by anticipation Vulcan, but its existence still remains unconfirmed, though M. Porro and M. Wolf of Zürich reported seeing its transit in 1876.

Vulcanist, the name applied to an old school of geologists at the end of the 18th and the beginning of the 19th centuries, who held that most rocks, but particularly the basalt, were due to volcanic or igneous agencies. They were opposed by the Neptunists led by Werner, who believed that this rock in common with most others was the product of crystallization from water.

Vulcanite, the harder of the two forms of vulcanized caoutchouc (see **VULCANIZATION**). It is differentiated from the softer product (soft rubber) in containing a larger quantity of sulphur and being cured at high temperatures. In color it is dark-brown, almost black, but it may be made jet-black by litharge or red by vermilion. It is not affected by the caoutchouc solvents, or by the mineral acids and alkalis. Owing to the large quantity of electricity evolved by it when rubbed, it is much used for the plates of electrical machines. The other applications of it are, of course, very numerous. Ebonite is a rarer name for it. See **INDIA-RUBBER**; **RUBBER MANUFACTURES**, **AMERICAN**.

Vulcanization, a method of so treating caoutchouc (q.v.) with some form of sulphur as

to effect certain definite changes in its properties and obtain a softer or harder product. The former is known as soft rubber, the latter as vulcanite (q.v.). The method of preparation of soft rubber goods is in general as follows: The gum is mixed with the suitable proportion of sulphur (usually 5 to 6 per cent), while other ingredients are added to make the caoutchouc, the most expensive constituent, go as far as possible. These other substances include litharge, whiting, and white-lead, a common formula being, rubber 16, sulphur 1, litharge 2, whiting 14, white-lead 2½. For some purposes, fabrics of cloth and rubber, and refuse vulcanized rubber, are also used in the mixture. After the mixture has been reduced to uniformity and rolled into sheets, it may readily be fashioned into any required shape. It may also be applied to one side or both sides of canvas or cloth, and, owing to the pronounced adhesiveness of the mixture, the coated goods may be fashioned into articles of practically a single piece. The harder product (vulcanite) is prepared in much the same way, the chief difference being in the proportion of sulphur, which is 6 to 8 parts, and in the high heats employed in curing. The process of vulcanization was invented by Charles Goodyear (q.v.), who obtained his first patent in connection with it in 1844. See *INDIA-RUBBER*; *RUBBER MANUFACTURES*, *AMERICAN*.

Vulgate. The, is the Latin translation of Bible, due mostly to Saint Jerome (q.v.), which has been adopted as the authorized Bible of the Roman Catholic Church. The name, *vulgata biblicorum editio*, which means common or current edition of the Scriptures, was first applied to the Septuagint and then to the Old Latin Version derived from it; but after Saint Jerome's new translation came into common use, it inherited the name. Some scholars still speak of the Old Latin Vulgate or the Greek Vulgate; but the name, used without qualification, properly applies only to the official Roman Catholic Bible.

Place in History.—Neglected for a long time, the Vulgate has during the last few decades won back from scholars a recognition of its intrinsic excellence, its importance for the study of the Bible text, and its place in history. In English-speaking countries, this is due mainly to the labors of Anglican divines, such as Westcott, Wordsworth, White, Scrivener, and Burkitt. Westcott, for instance, regards it as "not only the most venerable, but also the most precious monument of Latin Christianity." Its great antiquity and the exceptional qualities of its translator make it a most valuable aid toward the recovery of the original text. Its New Testament, in its revised form, is contemporary with the oldest Greek manuscripts and embodies a much earlier text. The Old Testament antedates by several centuries the oldest Hebrew manuscripts. Almost from the time of its publication, the Vulgate has had a very great influence upon the religion and civilization of Europe. It gradually became the Bible of Europe; it has been called the book of the Middle Ages. Latin then was the language of the educated and the Vulgate their Bible. From it was derived the theological language of Europe and much of its thought. Hebrew idioms came through it to enrich our daily speech. National

literatures took their rise in ventures to translate it: its text called forth the most beautiful work of the illuminators of manuscripts. Poetry, painting, and music owed to it much of their inspiration and grandeur. "It was the real parent," says Westcott, "directly or indirectly, of all the vernacular versions of western Europe," except the Gothic of Ulphilas. The translators of the Protestant versions had it constantly in hand, though it was "the guide" rather than the source of their work. Upon English Bibles, its influence is very marked, particularly upon the Authorized Version. The Psalter of the Prayer Book, still used in worship, is a translation of the Vulgate: such naturally, too, are all modern Roman Catholic versions, like the English Douai Bible.

Latin Bible Before Saint Jerome.—The Vulgate, we have implied, was preceded by an earlier Latin Bible, and its history cannot be properly understood without some account of its forerunner. Throughout the 4th century, this Old Latin Version, as it is called, was read in all the churches of northern Africa and western Europe, but the tradition of its origin seems to have perished. It is known that it was based, not on the original Hebrew, but upon the Greek of the Septuagint. This is its most notable difference from the Vulgate. It can be traced back with certainty to the middle of the 3d century and, with great probability, even a century earlier. Its place of origin is unknown; nor even can we determine whether there were several distinct translations, made in different times and countries, or originally but one. The Old Testament has survived in a few books and many fragments, but these do not shed much light on their origin; and the many manuscripts of the New Testament furnish to scholars no satisfactory solution. The old Latin Version is historically important by reason of its influence upon the Vulgate; moreover, despite its variations, it is a witness of the highest value to the current New Testament text of the 3d century. The books and fragments of the Old Testament also aid in determining the text, and sometimes the arrangement, of the Septuagint. Certain books of this ancient version, we shall see, were revised by Saint Jerome and incorporated in the Vulgate; a few were adopted without change and remain part of the Catholic Bible. It was the corrupt condition of the existing Latin text that caused Saint Jerome to undertake, first, a revision and then a translation of the Bible. We must remember that in his day, toward the end of the 4th century, the old version had been in circulation about 200 years. It is easy to see to what chances of corruption it was exposed. Experience proves that no manuscript can pass through many hands without the introduction of frequent changes and in the case of this old version, more than the ordinary causes of corruption seem to have been at play. Saint Augustine (q.v.), a younger contemporary of Saint Jerome, was so conscious of the almost innumerable variations in the current text that he advanced the theory—or possibly we should say, handed down the tradition—that there were almost innumerable distinct translations. Saint Jerome goes even further, stating that there were nearly as many types of text as there were manuscripts. This much is clear, that the confusion was almost hopeless and very perplex-

ing, whether we consider public worship or private devotion. There was an urgent need of a revised text, and Latin Christendom was most fortunate in possessing two men fitted to furnish it, Damasus the pope and Jerome the scholar. Damasus was the most distinguished pontiff of his century and left to posterity the fame of an enlightened and energetic reign. As to Jerome, Westcott does not exaggerate in saying that he was the one man in 15 centuries capable of the task he accomplished; without him, in all probability, Europe would have had to wait till the Renaissance for a translation comparable to the Vulgate. The history of his life is in great part the history of its production.

Saint Jerome (Eusebius Hieronymus, as he was called) was born of Christian parents at Stridon, on the borders of Dalmatia and Pannonia, now Szalad in Hungary, probably between 340 and 346 A.D. His father, Eusebius, a man of education and means, perceived the ability of the boy and sent him to Rome, at an early age, to complete his studies. There he awoke to the love of literature and, despite some aberrations, was strengthened in the love of religion—the two impulses which dominated his life and have left their impress on western Europe. Unconsciously, he was all along preparing himself for his great task, the translation of the Bible. He acquired a firm grasp of the Latin idiom, through his deep study of its literature, and laid the foundations of his subsequent thorough knowledge of Greek; at the same time, he was fostering that religious spirit which later caused him to devote himself to sacred rather than to secular studies. He was baptized in Rome about 366. Not long after, he removed to Trier, in Gaul, and later (370) to Aquileia in North Italy, where in the company of other young men of talent and piety, he vigorously pursued the study of theology. The company breaking up in 373, Jerome traveled in the East, visiting Greece, Asia Minor, and Syria. At Antioch, in Syria, a dream decided the work of his life: Christ, in an apparition, reproached him with being a Ciceronian and no Christian. Henceforth he gave himself to sacred studies and religious practices; in his old age, however, he was able to reconcile with them the reading and teaching of pagan literature. In the summer of 374, he retired to the desert of Chalcis, east of Antioch, where he spent five years in study and prayer. During this period, under the instruction of a Jewish rabbi, he made a diligent study of Hebrew; at this time, too, began his correspondence with Pope Damasus, which led later to such happy results. Jerome was ordained priest at Antioch, in 379, though he appears never to have exercised the functions of his office. In 380, we find him in Constantinople, the capital of the empire, where he fell under the spell of the winning and cultivated Saint Gregory Nazianzen. At length, in 381 or 382, he returned to Rome. He was soon admitted into the closest intimacy with Damasus, which lasted till the pope's death, in December 384. It was during this period (in 383) that Jerome, at the request of the pope, revised the Old Latin Version of the gospels and shortly after, of the remaining books of the New Testament. His Roman Psalter was also published about this time. Jerome had great popularity and influence at Rome under Damasus, and, nat-

urally, had made some enemies: their opposition increased after his patron's death and caused him to leave Rome forever, in August 385. He returned again to the East, his eager, inquisitive mind and his spirit of piety both impelling him to visit all the holy places of Palestine and to study its topography, cities, and traditions. Finally, in the autumn of 386, he settled at Bethlehem, near the cave of the Nativity, and built a monastery, over which he henceforth presided. In this retreat, during the last 34 years of his life, he "scorned delights and lived laborious days" of study, writing and meditation: their fruit was given to the world in his famous epistles, his commentaries and controversial writings, but above all in his translations of the Sacred Books. In his work on the Hebrew text, he was almost constantly assisted by learned rabbis. He died in 420.

Revisions of Old Latin Version.—New Testament.—Jerome's work as a reviser and translator began with the gospels (383). These books were the most important and familiar, and also, because of their wide circulation, the most corrupt in text. The task which Damasus committed to him, was not a new translation, but merely a revision of the familiar text. For this, Jerome collected and consulted the best Greek manuscripts he could find, and with their guidance, corrected the Latin wherever the sense required it. Shortly after the rest of the New Testament was corrected in the same way, though more slightly, it appears. All this work became part of the Vulgate: Jerome never made a fresh translation of the New as he did of the Old Testament.

Old Testament.—The Psalter, the prayer book of the Church in daily worship, was the first book retouched by Saint Jerome. In the course of his life, he published three editions of the Psalter; it will be convenient here, for clearness' sake, to speak of all three. The first or Roman Psalter, published at Rome in 383, was adopted there for public services and continued in use till the time of Pius V. (1566). For this revision, Jerome had recourse only to the Greek text. It never became part of the Vulgate and has gone out of use, except that the invitatory psalm (94) in the Breviary (qv) and the quotations from the Psalter in the Missal are taken from it. This revision itself becoming corrupt, through the errors of copyists, a second revision was called for. This, published at Bethlehem in 387, is the Gallican Psalter, so called, because it was adopted for public worship in the churches of Gaul. It was based likewise upon the Greek text, but is a more critical recension than its predecessor. It is now used throughout the Latin Church and has been incorporated in the Vulgate: yet it is not Jerome's best edition of the Psalter. This is conceded to be his third or Hebrew Psalter, a new translation made directly from the Hebrew (probably 392).

Other books of the Old Testament were revised by Jerome according to the Septuagint (qv): he himself mentions Job, Proverbs, Canticle of Canticles, and Chronicles by name, but it is believed, from his words, that he revised all the books of the Septuagint which are contained in the Hebrew Canon. All, however, have perished except Psalms, mentioned above, and Job.

Translations from the Hebrew.—Jerome's work as a reviser made him thoroughly acquainted with the great variations of the Septuagint text and threw him back, more and more, upon the Hebrew as the one standard. There, thanks to the watchfulness of the rabbis, he found instead of the confusing variety of the Septuagint an almost perfect agreement in the manuscripts. The controversy with the Jews, who taunted Christians with using a corrupt text, had great weight in determining Jerome to translate the Hebrew Bible. His friends, too, were repeatedly urging the task upon him, so he finally set about it, not following any set plan (he began with Samuel and ended with Esther), but translating such books as his friends requested. This translation, therefore, it appears, contrary to the impression of many, was not undertaken as an official work, destined for public services. He intended it primarily for the eyes of his friends and desired them, out of a fear of controversy, to keep it private. For about 15 years, from 390 to 405, he labored at this great task and succeeded in translating all the books of the Hebrew Canon (same as the Protestant Canon). Of the remaining books of the Old Testament, which are accepted as inspired by the Roman Catholic Church, he translated Tobias and Judith from the Aramaic, and from the Greek the passages of Daniel and Esther, which are not found in the Hebrew (Dan. iii. 24-90, xiii.-xiv.; Esther x. 4-xvi. 24). There is ground for believing that he translated or revised the books of Maccabees. Wisdom and Ecclesiasticus he left untouched, and passed over Baruch.

Reception of the New Translation.—Jerome's friends could not keep their good things to themselves; his translations, eagerly sought and copied, and soon widely circulated, raised a storm of opposition. The gospels, indeed, though sanctioned by the authority of Pope Damasus, had been bitterly attacked by many, but when his Old Testament was published and the extent of its variations from the Old Latin rendering of the Septuagint became known, Jerome found enemies in every quarter. The Septuagint was popularly regarded as an inspired translation, according to the well-known legend; to vary from it was to corrupt the word of God. So Jerome was sacrilegious and presumptuous in daring to correct the venerable text; he was disturbing the faith of the people. Even the great Augustine at first did not approve of his translation. Jerome defended himself with more than his usual warmth, especially, against the charge of disrespect toward the Septuagint: for had not he spent years of his life rendering it faithfully into Latin? Gradually the storm subsided; part of his work won favor and public recognition; the bitter attacks were passed—he died in peace and was recognized as a Saint and Doctor of the Church.

Vulgate During the Middle Ages.—It was long centuries, however, before the translation of Jerome became the Vulgate or official version. Old memories and affections were entwined around the ancient text and the new was looked upon as an intruder; just as in our own day, the Revised Version has thus far made no advance in public favor. At Rome, Jerome had great prestige because of his many friends there, his reputation as a scholar, and the patronage

extended to him by Damasus. Many of the clergy admired and used his version, and the example of Rome was followed in different parts of Europe. The remote provinces, like Britain and Africa, clung to the old. In the 6th century we see the new translation current almost everywhere except in Africa; yet Pope Gregory the Great, who saw the beginning of the next century and died (604) just 200 years after Jerome had completed his translation, did not enforce its usage. His marked preference for it, however, turned the tide in its favor and it spread rapidly all over Europe. In the 9th century it was used throughout the church; yet it is a curious fact that the Old Latin survived till the 13th century wherever the heresy of the Albigenses prevailed, and even, in Bohemia, till the 15th century (Berger, p. 74).

Corruption.—The old Bible did not die without leaving traces of itself upon its successful rival. It must be remembered that in the early Middle Ages the Bible circulated, not in one volume, but in separate books: it easily happened, then, that a new manuscript was copied, according to the books at hand, partly from the old, partly from the new translation. Many readings of the Old Version, too, found their way into the new, particularly in the gospels and epistles, where the familiar text, dwelling in the memory of the scribe, displaced Jerome's corrected text. In the synoptic gospels, containing so many parallel passages, the text of one gospel was often substituted for the text of another. Occasionally, though not frequently, a phrase was altered to give clearer expression to a dogma. Other sources of error existed, but the chief of all was the perennial one—the carelessness of scribes.

Efforts to counteract this downward tendency were unceasingly made during the Middle Ages. Cassiodorus, Alcuin, Lanfranc, Stephen Harding, and many others are mentioned as strenuous laborers in this field. Roger Bacon, we are told, spent nearly 40 years correcting and explaining the sacred text. Schools even were established for the purpose of recovering, diffusing, and handing down to posterity the pure text of God's word. Often the supposed corrections were themselves mistakes; yet they were perpetuated in many manuscripts, with the chance of being accompanied by new errors in every new copy. Their importance, however, must not be exaggerated. The many manuscripts of the Vulgate which we inherited from the Middle Ages show, so far as they have been examined, that these mistakes are seldom serious from a dogmatic or devotional point of view. Only the printing press seemed capable of preventing their multiplication, for the scholars of that time, as White says, had used all the remedies that could be applied before the invention of printing.

Printed Vulgate.—The press, at first, did little toward the restoration of a pure text. The best texts, it is believed, were preserved in the most handsome manuscripts and these were too costly to be sent to the printing shop. Inferior texts were consequently the first printed and little criticism was applied to correct them. The famous Complutensian Bible made an attempt at a critical edition of the Vulgate, but its success was slight. Stephanus, a French Protestant, was somewhat more successful. The printing press was multiplying Bibles rapidly and

VULGATE

mistakes as well, it may be said. According to White, during the first half century following the invention of printing, in 1436, it is computed that 124 editions of the Vulgate were printed; another count, from 1471 to 1599, enumerates 179 editions.

These editions were not mere reproductions, one of another, many different manuscripts had been consulted and many editors were at work, each using his judgment (or his whim) in the correction and choice of texts. To add to the variety, several new Latin translations, by both Catholics and Protestants, were put forth.

Decree of the Council of Trent.—It is easy to see how bewildering must have been this immense variety of old and new translations. A standard text had become imperative. It was necessary, too, since the question of the Canon of Holy Scripture was debated, to determine which books should be included in the Catholic Bible. Accordingly, in 1546, the Council of Trent closed the Canon, accepting as sacred and canonical all those books which the tradition of the Church, and especially the Council of Florence, had declared to be inspired; moreover, the decree specified that they were accepted "as they were had in the Latin Vulgate." In the same year the Council ordered that the Vulgate be printed in as correct a text as possible and requested the Pope to carry out the measure. These two important points—the books included in the Vulgate and the text authorized by the Roman Catholic Church—call for separate and somewhat detailed treatment.

Books Included in Vulgate.—First, we give a list of the Vulgate books, in their proper order, according to the names which they bear in the Douai translation. These names, it will be seen, often differ from those of the Authorized Version; they are derived from the Septuagint through the Latin, while the Protestant names come in part from the same source and in part directly from the Hebrew. We subjoin the latter wherever the difference is notable. The books of the Old Testament are: Genesis, Exodus, Leviticus, Numbers, Deuteronomy, Josue (Joshua), Judges, Ruth, I. and II. Kings (I. and II. Samuel), III. and IV. Kings (I. and II. Kings), I. and II. Paralipomenon (Chronicles), I. Esdras (Ezra), II. Esdras, or Nehemias, Tobias, Judith, Esther, Job, Psalms, Proverbs, Ecclesiastes, Canticle of Canticles (Song of Songs), Wisdom, Ecclesiasticus (Sirach), Isaias, Jeremias, Lamentations, Baruch, Ezechiel, Daniel, Osee (Hosea), Joel, Amos, Abdias (Obadiah), Jonas, Micheas (Micah), Nahum, Habacuc, Sophonias (Zephaniah), Aggeus (Haggai), Zacharias, Malachias, I. and II. Maccabees. In the New Testament, the books and their names are identical with those of the Authorized Version, except that the last book is called in the one Apocalypse and in the other Revelation. The Vulgate, as finally adopted by the Roman Catholic Church, is a mosaic: it is made up of direct translations from Hebrew, Aramaic, and Greek, of revisions of Old Latin, according to the Septuagint and the Greek New Testament, and, lastly, of Old Latin translations unrevised (See JEROME'S TRANSLATION FROM THE HEBREW.)

Differences Between Roman Catholic and Protestant Bibles.—The foregoing list will have made clear the most striking difference between

the Vulgate and the ordinary Protestant Bible of to-day—the inclusion of Tobias, Judith, Wisdom, Ecclesiasticus, Baruch, and I. and II. Maccabees among the sacred books of the Bible on an equal footing with the rest. These books were formerly printed in Protestant Bibles, sometimes as integral parts of Scripture, sometimes with an undefined standing, more frequently as being unequal to the other books, but useful "for example of life and instruction of manners." With them may be classed the additions to Esther and Daniel, mentioned in the fifth topic. All these portions of the Vulgate are now generally excluded from English Protestant Bibles, but find a place in the Lutheran. They are still used in the public services of the Anglican Church. Subtract these books from the Vulgate list and the order of the books in the two Bibles will be found identical. Many minute differences, which cannot be noticed here, are found in the inner arrangement, but more particularly in the numbering of the contents of several books. Textual divergences, naturally, are the most numerous, but their extent and importance have been greatly exaggerated. The Canon remains the only really great difference.

Official Text of Vulgate.—The order of the Council of Trent, promulgated in 1546, that an official text of the Vulgate be printed, remained unfulfilled till the reign of Sixtus V. (1585-1590). The attempts of previous pontiffs had led to little result. Sixtus summoned a commission of cardinals and scholars and entrusted them with the work; not content with this, he applied himself vigorously to the task, with more energy than critical acumen and with no scrupulous deference to the opinions of the commission. The edition, called after him the Sixtine, was completed and published in 1590, a few months before the death of the Pope. It was soon found to contain numerous errors, and all copies of it were recalled two years later by Clement VIII., who published a new and more correct text (1592). The Clementine Vulgate has ever since remained the official Bible of the Roman Catholic Church.

Sixtus V. had prefixed a Bull to his edition, declaring that it must be held as "the true, lawful, authentic, and undoubted" version of the Scriptures; he forbade anyone, under penalty of excommunication, to print a different edition of the Vulgate. This prohibition was also contained in the Clementine Bull. The effect of it was to put an end to the intolerable confusion of texts; indirectly, too, it is generally believed to have impeded the recovery of the true text of Saint Jerome. Some writers, Catholic and Protestant, have tried to extract from these Bulls a dogma of textual accuracy, this position is stultified by the action of Pope Clement, who recalled the "authentic" version of Sixtus and published another "authentic" version, differing from the former, it is said, in 3,000 places. The popes consider matters of discipline, but not of dogma, as subject to rectification. The action of Clement merely constitutes his edition the official Bible of the Church and guarantees its general trustworthiness and its freedom from doctrinal or moral error. The Clementine Vulgate, claimed to be better than any predecessor, but not to be perfect; it will probably give way itself to a more perfect version when modern scholarship shall have arrived at assured results.

Value of Vulgate Text.—Modern scholarship, however, is far from having settled the exact text either of the Old or of the New Testament, and Jerome's version remains one of the best witnesses to the originals, though its value is not uniform throughout. His revision of the gospels, to quote Bishop Westcott, "represents the received Greek text of the 4th century, and so far claims a respect, speaking roughly, equal to that of a first-class Greek manuscript." Jerome, it should be remembered, sought out the best manuscripts of his day; the type of text he followed corresponds partly to that in greatest favor at present, partly to another now no longer known. His revision of the rest of the New Testament was not so thorough and probably let many inaccuracies remain; he himself in his commentary on the Galatians departs at times from the received Latin text.

In the Old Testament Jerome followed a text almost identical with the Massoretic, and, therefore, of the greatest value. His translation shows him to have been "a good, but by no means immaculate, Hebrew scholar." In general, his work was done with the greatest care and light was constantly sought from learned Jews. Tobias and Judith, however, in whose canonicity he did not believe, were translated hurriedly. Almost all scholars would agree with the judgment of White, who says, in summing up this matter: "We may confidently assert that the general standard of the translation is a very high one."

Literary Qualities.—The language of the Vulgate was based upon the common conversational Latin of its day, used by all classes of the people; it differed greatly from the literary Latin and contained many words and forms considered archaic or rude. Despite the flavor which this origin frequently gives to the language of the Vulgate, the translation is greatly admired for its simplicity, clearness, flexibility, force and majesty. In the poetical and prophetic books it is unsurpassed. These fine literary qualities may be attributed to the genius of Jerome; yet they are present also in books which he did not touch. The Latin language, indeed, seems peculiarly adapted to render Hebrew thought and feeling; thus the Vulgate has ever been a favorite with literary men who love both the Bible and the language of Cicero, especially in continental Europe.

English Translations of the Vulgate.—The first English translation of the entire Vulgate is commonly attributed to Wyclif (c. 1384). The second is the work of Roman Catholic scholars in exile, who published the New Testament at Rheims, in 1582, and the Old at Douai, in 1609. The Rheims-Douai Version has remained ever since the Bible of English-speaking Catholics; passing through numerous editions, it has lost much of its original roughness and Latin phraseology and approached more closely to the King James Version. Scholars acknowledge its "anxious fidelity," whether in praise or blame, as well as its very great influence upon the interpretations and vocabulary adopted by the Authorized Version.

Bibliography.—White's lengthy article, 'Vulgate,' in Hasting's 'Dictionary of the Bible' (to which we are particularly indebted); also in same Dictionary, article, 'Latin Versions,' by Burkitt; Westcott, on Vulgate, in Smith's D. B.;

Kenyon, 'Handbook to Textual Criticism of New Testament'; 'Our Bible and the Ancient Manuscripts,' by the same; Gigot, 'General Introduction to the Scriptures'; Berger, 'Histoire de la Vulgate pendant les premiers siècles du moyen âge.' In Vigoroux, 'Dict. de la Bible,' articles 'Jerome,' 'Latines Versions'; Kaulen, 'Geschichte der Vulg.' For fuller biography, see White; also for list of Vulgate manuscripts.

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Vulpius, vool'pé-oos, Christian August, German writer: b. Weimar, Germany, 23 Jan. 1762; d. there: 25 June 1827. He was educated at Jena and at Erlangen, and under the direction of his brother-in-law, Goethe, he was later secretary of the court theatre at Weimar. He was appointed first librarian and overseer of the cabinet of coins in the library at Weimar in 1797, a position he occupied until his death. He wrote numerous plays, romances, etc., which were popular in their day, but are now scarcely remembered with the exception of 'Rinaldo Rinaldini, der Räuberhauptmann' (1797), which has been translated into various languages, and widely imitated. He also edited: 'Kuriositäten der physisch-litterarisch-artistisch-historischen Vor- und Mitwelt' (10 vols., 1810-23); and 'Die Vorzeit' (4 vols., 1817-21).

Vulture, any of various birds of prey which habitually feed on carrion. The vultures of the Old and New Worlds are quite distinct, the former constituting a family (*Cathartidae*) already sufficiently described under the articles CARRION-CROW, CONDOR and TURKEY-BUZZARD; while the latter are much more nearly related to the hawks and eagles (*Falconidae*), of which they are considered to be a subfamily (*Vulturinae*) or to form an allied family (*Vulturidae*). This group is distinguished by the possession of a strongly-hooked compressed bill; by short tarsi covered with reticulated or small polygonal scales. The middle toe is longer than the tarsus, and the hinder toe is a little elevated. The claws are blunt, but more or less hooked. The head and neck are frequently naked or covered with a light down. A large crop exists and the intestinal caeca and syrinx, wanting in the *Cathartidae*, are present. There are numerous other differences in skeletal and other parts. The cinereous vulture (*Vultur monachus*), is distinguished by the presence of a ruff of feathers, and by the crest borne on the back of the head. It inhabits Europe, Asia, and Africa, and is common. It may attain a length of three or four feet, and its color is a chocolate-brown with the naked head and neck blue. A long tuft of feathers springs from the base of the wings. The bird inhabits wooded situations as a rule, and appears to content itself with carrion, but rarely ventures to attack living animals. The nest is generally built in a tree.

The genus *Otologyps*, including the *O. calvus*, or Pondicherry vulture, and the *O. auricularis* or sociable vulture, is distinguished from the preceding genus by having a bare head and neck, with long wattles dependent from just below the head. The sociable vulture inhabits South Africa. It is colored a general blackish-brown, and its average length is four feet. The naked head and neck are light-red. The Pondi-

cherry vulture inhabits India, and is about three feet in length. Its head and neck are flesh-colored, and the chest bears a tuft of white feathers, the plumage generally being dark or blackish-brown. The genus *Gyps* is represented by the griffin or fulvous vulture (*G. fulvus*), and is distinguished by the bill being swollen or distended at the sides, the head and neck being covered with short down, and the neck possessing a ruff of long pointed or downy feathers. The griffin vulture inhabits Europe, Asia, and Africa. It attains a length of four feet, and is of a general yellowish-brown tint, the tail and wing quills being black, and the neck ruff white. The head is covered with white down. It is abundant about the Mediterranean countries, and builds its nest on cliffs. It is noted for its activity and great powers of flight. The Egyptian vulture (*Neophron percnopterus*) inhabits South Europe, Egypt, and Asia. It is white, the quill-feathers of the wings being dark brown or black, and the face, bill, and legs chiefly yellow. It is of small size and trim build. This bird is also known under the designations of "Pharaoh's chicken," and "white crow," and is protected by laws from being injured. Besides carrion it devours all kinds of refuse left by the larger vultures and small reptiles, insects, etc. In the weak bill and some other respects the Egyptian vulture somewhat approaches the *Cathartida*. The celebrated lammergeier or bearded vulture (*Gypatus barbatus*), a genus and species distinguished from the preceding by the head and neck being feathered, and by the cere being concealed by bristly hairs, resembles the eagles in appearance and habits and is now generally considered as the representative of a subfamily (*Gypatinae*) of the *Falconidae*. (See *LAMMERGEIER*.) Consult: Dresser, 'Birds of Europe' (London 1881); and Blanford, 'Birds of British India' (London 1895).

Vyasa, *vyā'sā* ("the redactor or arranger"), the author, according to tradition, of the Vedas, the Mahabharata, the Puranas—of all ancient Sanskrit literature. It is evident that in this name is embodied the fact that these works have from time to time undergone recension. The name Homer has exactly the same meaning as Vyasa.

Vyatka, or **Viatica**, *vē-āt'kā*, Russia, (1) a town, capital of the government of same name, advantageously situated near its centre in a beautiful district at the confluence of the Klinovka with the Vyatka, 458 miles by rail west of Perm. Its houses are surrounded by gardens, and there are also public gardens. It has two cathedrals and also monasteries. There is steamer communication with Kazan. Pop. about 27,000. (2) The government has an area of 59,329 square miles. The chief river is the Vyatka, which joins the Kama, a tributary of the Volga. There are low hills, especially in the north, and forests of fir, oak, elm, and birch are extensive. Flax and hemp are important crops, and among the chief minerals are iron and copper, which are extracted and smelted. There are manufactures of woollens, linens, potash, leather, firearms, anchors, gun-carriages, etc.

Vyrn'wy, a river of Wales, rising in the northwest of Montgomeryshire, and after a circuitous course of some 35 miles falling into the Severn on the Shropshire border. Lake Vyrnwy, not far from its source, the chief reservoir of the Liverpool waterworks, completed in 1892, was formed by constructing a huge dam or embankment across the river valley, a former Glacial lake basin, the result being an artificial sheet of water about five miles long with an area of 1,121 acres and an available capacity exceeding 12,000 million gallons. The length of the embankment is 1,260 feet, its height 60, the length of the aqueduct to Liverpool 68 miles.

W

W the twenty-third letter of the English alphabet. It serves both as consonant and vowel; as consonant when it begins a word or syllable, and as vowel at the end of a word or syllable, where it forms a diphthong with a vowel preceding it, as in *how*, *grew*. Its sound is that of a voiced labial formed by rounding the lips as for pronouncing *oo*, then contracting the aperture so that the voice issues with some friction. W is silent in many words and positions; examples: *gunwale*, *sword*, *two*; *wrap*, *wrong*, *wright*. Words beginning with *wh*, are pronounced as though the aspirate preceded, as indeed it did in written Anglo-Saxon: thus *why*, *what* are sounded *hwai*, *hwat*; but there is a tendency both in Britain and the United States to drop the aspirate in such words or to minimize it, so that *when*, *what*, *white* become *w'en*, *w'at*, *w'ite*: nor is this mispronunciation restricted to the vulgar; it may be heard in the speech of the cultivated class; but it is a vice of speech parallel to that of the lower-class Cockneys when they confound *v* with *w*, saying *vile* for *while* and *wile* for *vile*, *warden* for *warden*, and so on. W is silent in the words *who*, *whom*. W in *whole* and in *whoop* is intrusive, not existing in Anglo-Saxon *hal*, *hol*, nor in French *houper*. In German *w* is a consonant only and represents very nearly the sound of the English *v*, but is a little weaker: hence the English forename Edward is in German written Eduard. The consonant sound of *w* in the Gothic languages is generally replaced in the Latinish languages by *gu*; for example, *Walter*, *Gualtier*, *William*, *Gaillaume*, *war*, *guerre*. The form (the letter *v* doubled) and the name of this consonant (double *u*) were both a true form and a right name when *w* first came into use. At that time—13th century—and long after the one character *v* (V) stood for the vowel sound *u* (*oo*), and its name was *oo*; at the same time it was used as the sign of the consonant now represented only by *v*: thus, while in form *w* is what it is called in French, *double vey*, or double *ve*, in sound it is for us what its name in English denotes, that of double *u*: See U:V.

Waagen, vā'gēn, Gustav Friedrich, German art-historian: b. Hamburg, Germany, 11 Feb. 1794; d. Copenhagen, Denmark, 15 July 1868. He was educated at Breslau, Dresden, Heidelberg, and Munich, in 1830 was appointed director of the picture gallery at the Museum of Berlin, and he accepted the chair of history of art at the University of Berlin in 1844. His publications include: 'Kunstwerke und Künstler in England und Paris' (3 vols., 1837-9); 'Kunstwerke und Künstler in Deutschland'

(1843-5); 'Die Gemäldesammlung der kaiserlichen Eremitage in St. Petersburg' (1864); 'Die vornehmsten Kunstdenkmäler' (1866-7); etc.

Waahoo', or **Wahoo**, a small tree (*Ulmus alata*) of the southern United States, having small ovate, often falcate, leaves and spreading branches, which form an open, rounded head. The branches have wide, wing-like corky ridges, which have suggested the name winged elm. The tiny samaras are edged with a silky fringe. The tree, while growing naturally in damp places, is a valuable roadside shade-tree, where it is hardy. It has a chocolate-colored fine-grained, heart-wood, which has been used in the South for wheel-hubs.

The spindle-tree (q.v.) (*Euonymus americanus*) is also called waahoo.

Waal, wāl, Netherlands, the Dutch name for the lower course of the Rhine, which enters the country a few miles above Nimwegen, flows through the province of Gelderland, to its confluence at Gorinchem with the Meuse, and thence continues westward through a many-channeled delta to the North Sea.

Wabash, wā'bāsh, Ind., city, county-seat of Wabash County; on the Wabash River, and on the Cleveland, C. C. & St. L., and the Wabash R.R.'s; about 90 miles northeast of Indianapolis and 130 miles southeast of Chicago. It is in an agricultural and stock-raising region, but it has considerable manufacturing interests. In 1900 (government census) the city had 109 manufacturing establishments, with capital invested, \$2,430,502. The number of wage-earners was 1,241; and the average annual amount paid in wages was \$589,355. The cost of material used was \$1,206,726, and value of annual products was \$2,225,990. The chief manufactures are flour, paper, spokes, carriages, woollen goods, machine shop products, lumber products, shoes, and hats. There are railroad repair shops, lumber and coal yards. The principal public buildings are the Soldiers' Memorial Hall, Masonic Temple, Woman's Orphan Home, and the county court-house. There are three parks. The educational institutions are a high school, graded schools, Wabash City Library, and a high school library. There are four banks, three national and one private, having (1903) a combined capital of \$331,000, and deposits amounting to \$1,457,000. The first settlement was made in 1837 and the same year the town was incorporated. In 1866 it was chartered as a city. The government is administered under the charter of 1866, which provides for a mayor, who holds office two years, and a council. Pop. (1910) 8,687.

Wabash, a river which has its rise in the western part of Ohio, flows northwest until it

WABASH COLLEGE—WACO

enters Indiana, where it takes an almost westerly course to Logansport, then flows southwest to Covington in Fountain County, then nearly south to the Ohio River. For about 120 miles of its lower course it forms the boundary between Indiana and Illinois. The total length is about 555 miles. It is the largest tributary of the Ohio, entering it from the north. The Wabash is navigable to Covington, about 300 miles, and when the water is high, to Lafayette. From Terre Haute to Huntington, the river is paralleled by the Wabash and Erie Canal which connects the river with Lake Erie.

Wabash College, located at Crawfordsville, Ind. It was established by four Presbyterian missionaries in 1832, was first opened to students in 1833, and obtained a charter from the legislature in 1834; the present site of the college was purchased in 1835. Though affiliated with the Presbyterian Church, the college is non-sectarian in control; the board of trustees number 21, of whom four are representatives of the alumni. Wabash is distinctively a small college aiming to give thorough college training, but not to do technical or university work. It is not co-educational, in which respect it stands almost alone among the colleges of the West and Middle West. Formerly the college conferred three degrees, A.B., B.Ph., and B.S., requiring a thorough course in Greek for the A.B. degree. All college courses now lead to the single degree of A.B. The course includes 104 hours of prescribed work, and 84 hours elective. Special courses are arranged by which technical and professional courses may be shortened in certain approved schools. There is a fellowship in English, a students' loan fund, and many prizes. A summer school under private control is conducted on the college grounds, work in which may count toward a degree. There is also a preparatory course. The college grounds contain 40 acres located in the heart of the city. On this campus are South Hall (occupied by the biological department and the museum), Center Hall, the gymnasium, Peck Scientific Hall, and Yandes Library Hall. The library in 1910 contained 45,000 volumes; the students numbered 384.

Wabasha, Minn., city, county-seat of Wabasha County; on the Mississippi River, and on the Chicago, Milwaukee & Saint Paul Railroad; about 30 miles northwest of Winona and about 100 miles southeast of Saint Paul. Lake Pepin, an expansion of the Mississippi, is about two miles above the city. Wabasha is in a fertile agricultural region, and has several manufacturing, chief of which are flour and oatmeal mills, foundry, machine shop, lumber mill, soap factory and a church furniture factory. The national bank has (1905) a capital of \$50,000 and deposits of \$250,000. Pop. (1890) 2,487; (1900) 2,528; (1910) 2,622.

Waccamaw, a tribe of North American Indians who, in the 18th century, lived on Waccamaw River of eastern South Carolina. They are last mentioned in 1755, after which date, it is supposed, they became incorporated with the Catawbas. From their association, the Waccamaws are believed to have belonged to the Siouan stock.

Waccamaw, a river which has its rise in the southeastern part of North Carolina, and is the outlet of Waccamaw Lake. It flows

south into South Carolina and joins the Great Pedee on the southern boundary of Horry County. Below the confluence of the rivers, the stream is often called Waccamaw. It enters the ocean through Winyah Bay. From the source of the Waccamaw to the Great Pedee is about 130 miles.

Wace, wās, an Anglo-Norman poet: b. Island of Jersey 1115; d. 1184. His Christian name is generally believed to have been Richard or Robert. He was patronized by Henry II of England, who made him a canon of Bayeux, Normandy. Two important works by him remain, the 'Brut d'Angleterre' and the 'Roman de Rou,' a history of Rollo and the dukes of Normandy, including the conquest of England.

Wace, wās, Henry, English Anglican clergyman: b. London 10 Dec. 1836. He was educated at Marlborough, Rugby, King's College, London, and Brasenose College, Oxford. He served curacies at Saint Luke's, Berwick Street, London 1861-3, and St. James', Piccadilly, 1863-9, and Grosvenor Chapel 1870-2, was chaplain of Lincoln's Inn 1872-80 and preacher there 1880-96. He was professor of ecclesiastical history in King's College 1875-83, in 1881 became a prebendary of St. Paul's, and in 1883 chaplain to the Archbishop of Canterbury and principal of King's College. He was Boyle lecturer ('Christianity and Morality') (1874-5) and Bampton lecturer ('The Foundations of Faith') (1879), but is best known as joint editor with Sir W. Smith of the great 'Dictionary of Christian Biography' (1877-87), and as himself the editor of the 'Speaker's Commentary on the Apocrypha' (1886).

Wachusett, wā-chū'sēt, Mount, an isolated peak in Worcester County, Mass., seven miles southwest of Fitchburg. The altitude is 2,018 feet, and the view from the summit, embracing a picturesque valley and several small bodies of water, is most beautiful.

Waco, wā'kō, a subtribe of the Wichitas (q.v.).

Waco, Texas, city, county-seat of McLennan County; on the Brazos River at the mouth of the Bosque, and on the San Antonio & A. P., the Missouri, K. & T., the Waco & N. E., the Saint Louis S. W., the International & G. N. the Houston & T. C., and the Texas C. R.R.'s; about 94 miles north by east of Austin and 85 miles south by west of Dallas. Waco is in a fertile agricultural region in which grain and cotton are the chief products.

Industries.—In 1909 (government census) the city had 92 manufacturing establishments representing about 75 industries. The capital invested in manufacturing plants was \$3,561,000; the number of wage-earners 1,239, and the average annual amount paid to wage-earners, \$808,000. The amount paid annually for raw material was \$2,965,000, and the value of the annual products was \$4,746,000. The chief manufactures were cotton products, printing plant products, men's clothing, wagons and carriages, watches, and foundry and machine shop products. The products of the saddlery and harness works were, for 1900, \$427,431, and ranked first in value among the industries of the city. Mineral and soda waters brought a combined revenue of \$77,433. Waco ranked seven among the cities of Texas in the value of manufactured products. The city is the principal inte-

rior cotton market of the State. In 1900-1901 it received and shipped over 210,000 bales. It is the great distributing centre between Austin and Dallas.

Municipal Improvements.—The city is well laid out, the streets are broad; over 60 miles are paved with asphalt, macadam, and gravel. The sewer system is excellent, over 100 miles of mains have been laid out. The waterworks are owned by the municipality, the purchase was made in 1903, and an issue of \$500,000 of bonds was effected, and the same were sold to pay for the water plant and works. There are a number of artesian wells, which have a medicinal value sufficient to attract many health seekers. A tubular-well system furnishes daily nearly 6,000,000 gallons of water. The city is surrounded by considerable prairie land which is used for park purposes, and there are three cemeteries. Waco is noted for its healthfulness, cool in summer, mild in winter; and with pure water and good sewerage, there are no opportunities for disease germs to flourish. Several bridges span the Brazos River, one a suspension bridge with 475 feet span. A cantilever bridge, for wagon traffic, built in 1901 by the city and county, cost nearly \$110,000.

Public Buildings.—The principal public buildings are the government building, county court-house, the churches, schools, banks, and some of the business blocks. The court-house, finished in 1903, is built of Texas limestone, and cost nearly \$300,000. The Masonic Order of Texas built here in 1904 and 1905 a Masonic Temple which cost about \$250,000. The city has hospitals, sanatoriums, and an Orphans' Home.

Churches and Schools.—There are 47 churches, representing nearly all denominations. The educational institutions are four colleges: Baylor University (Bapt.), opened in 1845; Texas Christian University (Christian), opened in 1873; Saint Basil's College (R. C.), opened in 1900; Paul Quinn College (African Methodist Episcopal), opened in 1881. There are four institutions doing high school work: two public high schools, the central, for white pupils, and the high school for colored pupils. The Douglas-Schuler School (M. E. So.), and the Academy of the Sacred Heart are private schools doing high school and more advanced work. There are 13 ward public school buildings and one Roman Catholic parish school. Waco has two business colleges, which have a high standing, one city library (building cost about \$30,000), and several school libraries.

Banks and Finances.—Waco has four national banks, two savings banks, and one state bank, capitalized for nearly \$1,500,000. The municipal receipts and expenditures are over \$400,000. The chief items of expense are the schools and the interest on the bonded and floating debt.

Waco was surveyed as a town in 1849 and incorporated in 1850. Its growth in population has been steady and has more than kept pace with the growth in commerce. The rich surrounding country furnishes raw products sufficient for the support of a large manufacturing and commercial city. Pop. (1880) 7,295; (1890) 14,445; (1900) 20,686; (1910) 26,425.

ALLAN D. SANFORD,
Mayor.

Wad, a soft black mineral, consisting chiefly of the oxides of manganese, MnO_2 and MnO , but with varying percentages of one or more other metallic oxides and also water. Several prominent varieties and many minor varieties have been named, thus "bog manganese" contains iron, silica, alumina and baryta besides the usual much larger percentage of the manganese oxides and water. Asbolite or "earthy cobalt" contains oxide of cobalt up to 32 per cent. Lampadite contains from 4 to 18 per cent of oxide of copper. Wad frequently occurs in loosely aggregated masses which thus seem very light, but its specific gravity rarely falls below 3, and is sometimes as much as 4.26. Though usually so soft as to soil the fingers, its hardness may be as high as 6. Besides the common amorphous form, reniform masses and incrustations are frequently found, while beautiful arborescent infiltrations of wad occur in seams of quartz and other minerals (see Figure 12 under MINERALOGY). Wad and the closely related mineral psilomelane are important ores of manganese and occur abundantly in very many localities.

Wad. See GUNNERY.

Wadai, wā-dī', or **Waday**, Northeast Africa, an extensive and semi-civilized negro state in Central Sudan, between Kanem and Bagirmi in the west and Darfur in the east, since 1899 recognized as within the French sphere of influence. With dependencies its area is estimated at 170,000 square miles and its population at about 5,000,000. It consists principally of an elevated plateau, very fertile in some parts, producing abundantly maize, millet, indigo, cotton, etc. Ivory and slaves are also largely dealt in. The inhabitants are warlike, and exercise tributary rights over several neighboring settlements; their aggressive policy was somewhat checked by the Mahdi who inflicted a crushing defeat on the sultan of Wadai's forces in November 1888. This sultan, Ibrahim, was deposed in 1901 and succeeded by the present ruler, Abugazali. The kingdom of Wadai dates from 1635. The prevailing religion is Mohammedan. Capital, Abeche.

Waddell, wōd-dēl', James Iredell, American naval officer: b. Pittsboro, N. C., 13 July 1824; d. Annapolis, Md., 15 March 1886. He was appointed midshipman in the United States navy in 1841, became lieutenant in 1855, and in 1861 resigned his commission in order to join the Confederate navy the next year. He was engaged in the repulse of the Union forces at Drewry's Bluff, James River, Va., was sent to England by the Confederate government in 1863 and in 1864 took command of the Shenandoah, with which he began a piratical cruise against the commerce of the United States which lasted 13 months. He carried the Confederate flag around the world, captured 38 vessels and sailed under the Confederate flag for six months after Lee's surrender. He then turned his ship over to the British government which in turn transferred it to the hands of the United States consul at Liverpool. After residing for several years abroad Waddell returned to the United States and in 1875 became a commander in the service of the Pacific Mail Steamship Company.

Waddell, John Alexander Low, American engineer: b. Port Hope, Ontario, 15 Jan. 1854

He was graduated from Rensselaer Polytechnic Institute in 1875, and in 1876-7 was engaged in engineering work on the Canadian Pacific Railway. He was assistant professor of rational and technical mechanics at the Rensselaer Institute in 1878-88, and in 1882-6 was professor of civil engineering at the Imperial University of Japan. Since 1887 he has been engaged as a consulting bridge engineer. He is a member of various American and foreign societies, and in 1888 was decorated by the Emperor of Japan, Knight Commander of the Order of the Rising Sun. He has published: 'Designing of Ordinary Iron Highway Bridges' (1884); 'A System of Iron Railway Bridges for Japan' (1886); 'De Pontibus' (1898); 'Specifications for Steel Bridges' (1900); etc.

Wadding, wăd'ing, Luke, Irish Franciscan friar: b. Waterford, Ireland, 16 Oct. 1588; d. Rome 18 Nov. 1657. After studying theology at the Lisbon Jesuit Seminary he entered the Franciscan Order in 1605, and became professor of divinity in the University of Salamanca. He went to Rome in 1618, where he founded the Irish Franciscan College of St. Isidore (1625), served as papal councillor in the controversy with the Jansenists, whose tenets he held at first, but presently renounced; and was procurator of his order (1630-4). He wrote 'Annales Ordinis Minorum' (1626-40; new ed. 24 vols. 1731-47); 'Scriptores Ordinis Minorum' (1660; new ed. 1806); and edited Calasio's posthumous 'Biblical Concordance' (1621) and the works of Duns Scotus (1620).

Waddington, wăd'ing-tôn, George, English educator: b. Tuxford, England, 7 Sept. 1793; d. Durham, England, 20 July 1869. He was educated at Trinity College, Cambridge, and received a fellowship there in 1818. He traveled in foreign countries for several years, was appointed commissary and official of prebend at Masham in 1833; was prebendary of Ferring, Chichester Cathedral in 1833-41; and from 1840 until his death was dean of Durham. His writings include: 'Journal of a Visit to Some Parts of Ethiopia' (1822); 'A Visit to Greece in 1823 and 1824' (1825); 'History of the Church from the Earliest Ages to the Reformation' (1833); 'History of the Reformation on the Continent' (1843); etc.

Waddington, Samuel, English poet: b. Boston Spa, Yorkshire, 9 Nov. 1844. He was educated at Brasenose College, Oxford, became a contributor to the leading English journals and reviews, and besides editing several anthologies, such as 'English Sonnets by Living Writers' (1881), and 'Sonnets of Europe' (1886), published also: 'A. H. Clough: A Monograph' (1883), 'Poems' (1896), and 'Collected Poems' (1902).

Waddington, Fr. vâ-dân-tôn, William Henry, French statesman and diplomat: b. St. Remi-sur-l'Avre, Eure-et-Loir, 11 Dec. 1826; d. Paris 1; Jan. 1894. He was educated at Trinity College, Cambridge, England, for some years devoted his attention to archaeological research, was admitted in 1865 to the Académie des Inscriptions et Belles-Lettres, and did not enter politics until he stood unsuccessfully for the department of the Aisne in 1865 and 1869. Minister of public instruction in the extremely short-lived cabinet of Dufaure 19-24 May 1873, he was elected senator for the Aisne in 1876, and

was again minister of public instruction in 1876-7. In December 1877 he received the portfolio of foreign affairs, in 1878 took a distinguished part in the Congress of Berlin, and 4 Feb. 1879 became prime minister. His delay in the matter of needed reforms lost him the support of all parties, and he retired 27 December. He held the London embassy in 1883-93. His writings include editions of the edict of Diocletian (1864) and Le Bas' 'Voyage Archéologique' (1867-77); an essay on 'The Protestant Church in France' in 'Cambridge Essays' (1856), and 'Mélanges de Numismatique et de Philologie' (1861). Consult Mme. Waddington, 'Letters of a Diplomat's Wife' (1903).

Wade, wăd, Benjamin Franklin, American lawyer and political leader: b. near West Springfield, Mass., 27 Oct. 1800; d. Jefferson, Ohio, 2 March 1878. In 1821 he went to Ohio, where after spending a few years in farming he took up the study of law, was admitted to the bar in 1827, and in 1831 formed a partnership with Joshua R. Giddings (q.v.), and built up a large practice. In 1837 he was elected to the State senate as a Whig, where he procured a resolution against the annexation of Texas; he also opposed the Kentucky Slave Bill, and on this account failed of re-election in 1839; but was again elected in 1841. He took active part in the campaign of 1840, and in 1847 was elected the presiding judge of the 3d Judicial Court of Ohio, where he acquired high standing as a jurist. In 1851 he was elected to the United States Senate, and re-elected in 1857 and in 1863, thus serving throughout the Civil War. He was a firm opponent of slavery, voted to repeal the Fugitive Slave Law, and in opposition to the Kansas-Nebraska Bill. After the election of Lincoln in 1860, he opposed any compromise between the North and the South; from 1861-2 was chairman of the joint committee on the conduct of the war, and advocated a vigorous policy and the immediate emancipation of the slaves. In 1864 he opposed the policy of the President and moderate Republicans in regard to Reconstruction, and with Senator Davis issued the Wade-Davis manifesto strongly criticising the President's policy. He was elected president *pro tem* of the Senate, and was thus acting vice-president of the United States in 1865, after Lincoln's assassination. His ability in debate, fearlessness, and honesty gave him a leading position in the Senate and commanded the respect of his associates. Consult Riddle, 'Life of Benjamin F. Wade' (1886).

Wade, Sir Thomas Francis, English diplomatist: b. London 25 Aug. 1818; d. Cambridge 31 July 1895. He studied at Trinity College, Cambridge; entered the army in 1838; in 1841 was promoted lieutenant in the 98th regiment, detailed for service in China; and was successively interpreter at Hong Kong and vice-consul at Shanghai. From 1861 to 1871 he was a member of the British legation at Peking, and from 1871 to 1883 ambassador there. In 1888 he was made the first professor of Chinese at Cambridge University. His large and important Chinese library is now in the possession of that institution. He published 'The Peking Syllabary' (1859); 'Yü-yen Tsü-erh Chi: A Progressive Course in Colloquial Chinese' (1867); and other standard works on China and the Chinese.

Wadlai, wā-dē-lī', Central Africa, a military post in the equatorial province of the Egyptian Sudan, on the Nile not far below the Albert Nyanza. It is famous as the chief station of Emin Pasha (q.v.), governor of the province, who, after the Mahdist rising, was cut off from civilization, and who was relieved by Stanley.

Wadesboro, wādz'būr-ō, N. C., town, county-seat of Anson County; on the Seaboard Air Line and the Atlantic Coast Line R.R.'s; about 120 miles southwest of Raleigh and 50 miles southeast of Charlotte. It is in an agricultural region in which the chief products are cotton and tobacco. The principal buildings are the county court-house, the Anson School Institute, opened in 1854, and the churches and schools for both races. The two banks, one national and one state, had (1903) a combined capital of \$75,000. The national bank had deposits amounting to \$180,000. Pop. (1910) 2,376.

Wadham (wōd'am) College, Oxford University, England, was founded in 1610 by Dorothy, widow of Nicholas Wadham of Mayfield, Somersetshire, England, for a warden, 15 fellows, 15 scholars, two chaplains, and two clerks. One of the fellowships was diverted in 1857 to the endowment of the chair of experimental philosophy. The scholarships have an annual value of \$400, and are tenable for five years; and there are besides 10 Hody exhibitions (six Greek, four Hebrew) of \$250, two Wright exhibitions (1874) for scholars of Manchester grammar school, etc. Wadham College presents to 12 livings. The 17th century college buildings and the college garden are attractive features; the library is rich in rare Spanish books. Among Wadham's distinguished alumni are Admiral Blake and Sir Christopher Wren.

Wadi, wā'dé, or **Wady** (Arabian, "ravine"), in Palestine and Arabia, either a river or river valley, or the basin of a torrent. Renan thinks this word was adopted by the Greeks and corrupted into oasis. It has passed into the Spanish gual, with which many of the Spanish river names begin; thus Wadi-l-Kebir (Arab. "great river") appears as Gualdquivir, Wadi-l-hajarah ("river of stones") as Guadalquivir. The ravines of Malta commonly go by the name of wye or wied, a corrupted form of wadi.

Wadleigh, George Henry, American naval officer: b. New Hampshire 28 Sept 1842. He was graduated from the United States Naval Academy in 1863 and was assigned to blockade duty with the West Gulf Squadron, serving until the close of the war. He was commissioned master in 1865, commander in 1880, served on the Arctic expedition in search of the Jeannette in 1881, was promoted captain in 1894, and in 1895-7 was in command of the Minneapolis on the coast of Asia Minor, engaged in the protection of American missionaries. He commanded the flag-ship Philadelphia in the Pacific station during the Spanish war, and after the conclusion of peace was in command of the Wabash at the Boston navy-yard. In 1902 he was promoted rear-admiral and was retired several months later in that year.

Wadlin, Horace Orsely, American statistician: b. Wakefield, Mass., 2 Oct 1841. He studied architecture in Salem and in Boston, Mass., and in 1874-9 was engaged in the practice of that profession in the latter city. He

was appointed special agent for the Massachusetts Bureau of Statistics of Labor in 1879 and upon becoming its chief in 1888 abandoned his professional practice. He resigned this position in 1903 to accept the post of librarian at the Boston Public Library, which he has since occupied. He was a member of the Massachusetts legislature in 1884-8, was supervisor of the United States census in 1890 and in 1900, and also of the Massachusetts census of 1895. He has published: 'Reports on Statistics of Labor of Massachusetts' (14 vols., 1888-1901); 'Annual Statistic of Manufactures of Massachusetts' (16 vols., 1888-1901); 'Decennial Census of Massachusetts' (7 vols., 1895); etc.

Wadsworth, wōds'werth, James Samuel, American soldier: b. Genesee, N. Y., 30 Oct. 1807; d. 8 May 1864. He was educated at Hamilton College, Harvard, and Yale, though he was not graduated from any one of these institutions; studied law with Daniel Webster, and was admitted to the bar in 1833. He did not, however, practise his profession, his attention being given to the management of his extensive estates in western New York. He enlisted as a volunteer in the Union army early in 1861; was appointed a brigadier-general in August of that year; and became military governor of the District of Columbia in March 1862. In that year also he was the Republican candidate for governor of New York, but was defeated by his opponent, Horatio Seymour (q.v.). He was engaged in the battles of Fredericksburg, Chancellorsville, Gettysburg, and the Wilderness as commander of a division, and was mortally wounded in the last named battle, dying two days later.

Wadsworth, Ohio, village in Medina County; on the New York, Pennsylvania & Ohio Railroad; about 30 miles south of Cleveland and 15 miles west of Akron. It was settled in 1816, and in 1865 was incorporated. It is in an agricultural region in which tobacco is one of the important vegetable products. In the vicinity are large beds of coal, valuable sandstone quarries, and extensive deposits of fire-clay. There are also deposits of clay and other. The chief manufactures are door and window screens, wagons and carriages, steam injectors, flour, and machine shop products. There are eight churches, a normal school, graded public schools, and a library. There are two national banks which have a combined capital of about \$75,000 and deposits amounting to about \$400,000. Pop. (1910) 3,073.

Wady-Halfa, wā'dé-hāl'fā, Egypt, the capital of a second-class district in the Sudan, on the east bank of the Nile, one mile below the second cataract, and at the junction of the branch lines of the military railroad to Khartoum and Kerma. Its notable features are two ancient temples. Pop. with suburbs about 3,200.

Wafer, (1) A thin circular cake of unleavened bread, generally stamped with the Christian monogram, the cross, or other sacred symbol, and used in the Roman and several other churches in the administration of the Eucharist. (2) A small disk of dried pasta, used for sealing letters, etc.

Wager, a bet or something staked on the event of a contest or some unsettled question. The party whose opinion proved to be correct

WAGER POLICY — WAGNER

receives what has been staked by both. By statutes of England and the United States, all contracts or agreements, whether by parole or in writing, depending on wagers, are null and void, and money due thereon cannot be recovered in any court of law. A wager is therefore merely a debt of honor. See GAMBLING.

Wager, or Wagering, Policy, in insurance law, a pretended insurance, in which the insured possesses no legal interest in the subject-matter of the insurance or the risk insured against. Therefore it is really a wager between insurer and insured that the uncertain event referred to will or will not take place. The "stakes" of the insurer are represented by the sum insured; those of the insured, the paid premium. See INSURANCE.

Wages, the payment given for personal services, as contradistinguished from money received for anything sold: thus when an author publishes a book, or a shoemaker sells a pair of shoes, the sums received are not wages, although they are to the seller virtually the same thing. The term wages is now usually restricted to the money paid at short intervals for mechanical or muscular labor, the term salary being applied to the remuneration of the services of bank, railway, and other managers, overseers, and clerks, paid at longer intervals, as quarterly, half-yearly, etc.; and fee to money paid for the services of lawyers, doctors, paid at special times according to custom. As to the laws regulating the rise and fall of wages, see POLITICAL ECONOMY; also see UNIONISM.

Wagner, Charles, French Protestant leader: b. Wickersville, Alsace, 3 Jan. 1852. At the age of 14 he was sent to Paris to school; was graduated at the Sorbonne in 1869; and studied theology at Strasburg and Göttingen. He was the pastor of a small parish in the French province of Voages until 1882, when he went to Paris, and there opened a Sunday-school, and later began preaching. The publication of his book 'Jeunesse' ('Youth') in 1891 marked him as a leader in the ethical movement in France, and his influence has since continually increased. Besides serving as pastor to a large congregation, he has taken an active part in many philanthropic and charitable undertakings, and in this work comes into cordial relations with men of all shades of religious belief. His other publications translated into English include 'The Soul of Things'; 'By the Fireside'; 'The Better Way'; 'The Simple Life'; 'On Life's Threshold' (1905). Of these 'The Simple Life' has attracted particular interest in the United States and has been widely commended by religious and ethical leaders. In the fall of 1904, Pastor Wagner visited the United States, where he made numerous addresses.

Wagner, vāg'nēr, Moritz, German naturalist: b. Baireuth 3 Oct. 1813, d. Munich 31 May 1887. He studied at Erlangen and Munich, and made extensive scientific journeys, in 1852-3 through North and Central America and the West Indies; in 1857-60 through the Andes from Panama to Ecuador. He was made professor of geography and ethnology at Munich. Among his writings are: 'Travels in the Regency of Algiers' (1841); 'The Caucasus and the Land of the Cossacks' (1847); 'Journey to Colchis' (1850); 'Journey to Ararat and the Armenian

Highlands' (1848); 'Travels in Persia and in the Land of the Kurds' (1851); 'Scientific Travels in Tropical America' (1870); 'The Darwinian Theory and the Law of Migration of Organisms' (1868).

Wagner, Richard, German composer, creator of the modern music drama: b. Leipzig 22 May 1813; d. Venice 13 Feb. 1883. His father, a clerk in the police court, who had been appointed chief of police by Marshal Davoust during the French occupation of Leipzig, died when Richard was only six months old; and the widow, left with seven children, married, nine months later, Ludwig Geyer, a well-known actor, playwright, and portrait painter, as well as a tenor. His appearances at the opera in Dresden, where he lived, gave young Richard opportunity to become familiar with the operas then in vogue, his favorite being Weber's 'Freischütz' which made a deep impression on him and determined the direction of his own genius to such a degree that it has been aptly said that it was Weber who wrote the first 'Wagner Opera.' When Geyer died, Richard was eight years old, and he had not, up to that time, shown any special talent for music; indeed, he played the piano so badly that his teacher told him he would never amount to anything. His poetic talent began to manifest itself when he was 11. Shakespeare became his model, and at 16 he had completed a tragedy, a sort of compound of Hamlet and Lear, in which he killed off so many of the characters (42) that most of them had to be brought back as ghosts to prevent the play from coming to an untimely end. It was his desire to set this to music that first decided him, at 16, to become a musician. He took some lessons, and after a few preliminary trials, wrote a piece concerning which he himself said afterward that 'Beethoven's ninth symphony appeared like a simple Pleyel sonata by the side of this marvelously complicated overture.' These youthful extravagances were prophetic of the man who was to revolutionize the opera by his bold defiance of all conventions. In 1830 he entered the University of Leipzig as a student of philology and esthetics; but music claimed most of his attention, and he wrote, among other things, a symphony which showed such a remarkable mastery of the methods of classical composition as to indicate that he could have become one of the great masters in the concert field had not the inclination of his genius taken him into the operatic domain. He wrote his first opera at Würzburg, where he had secured an engagement as chorus master; it was entitled 'The Fairies,' but was not performed till five years after his death, at Munich.

His second opera, 'Das Liebesverbot' (based on 'Measure for Measure'), had a deservedly unsuccessful production at Magdeburg. Then he accepted an appointment as conductor at Königsberg, where he married a pretty actress, Minna Planer; and in the following year he moved again, to the Russian town of Riga, where he wrote the libretto and the music of the first two acts of 'Rienzi.' This opera was planned on such a big scale that he knew he never could have it properly produced at a provincial theatre, wherefore he boldly resolved to go to the headquarters of spectacular opera — Paris — and try there to rival the popular idol, Meyerbeer, in his own field. With his wife and

a huge Newfoundland dog he embarked at Pillau for London; the voyage lasted nearly four weeks; three times the ship was tossed by violent storms, and it was during these that Wagner got the realistic "local color" for his 'Flying Dutchman,' the story of which was engaging his attention at the time. Paris did not prove hospitable to the German musician. He tried in vain to have one of his operas produced; no one cared for the French songs he wrote, and which he was finally glad to sell in Germany at \$4 apiece, he could not even get a place as chorus singer in a Boulevard theatre. Luckily he found a music publisher, Schlesinger, who paid him for proof-reading and arranging popular melodies and operatic scores for piano and cornet and other instruments. Wagner also wrote some interesting musical essays and novelties which were printed and paid for, and which contain many autobiographic details. He completed 'Rienzi' and also wrote the music of the 'Flying Dutchman'; but finally after nearly three years of starvation and numberless disappointments left Paris for Dresden, whence he had received a request for his 'Rienzi.'

With the return to Germany begins the second period in Wagner's life. 'Rienzi' was produced at Dresden on 20 Oct. 1842, and proved such a brilliant success that there was a demand for his other opera, 'The Flying Dutchman,' which was given on 2 Jan. 1843, only about ten weeks after 'Rienzi.' This proved to be less of a success; the performance was poor, and the audience was puzzled and displeased when, in place of the usual airs and processions it found an opera without arias, duos, and dances—an opera so new in form and spirit that few could understand it. Only four performances were given. However, 'Rienzi' had made Wagner the hero of the day; he was appointed royal conductor, and kept that position about six years. His next opera, 'Tannhäuser,' departed more widely still from the accepted models. It was produced on 19 Oct. 1845 and, to Wagner's chagrin, seemed to give pleasure only in so far as it resembled the old-fashioned operas. However, he persevered in his path of reform and wrote 'Lohengrin.' It was finished in 1848, but he could not even get it accepted for performance. Nor could he get any attention for his plans for reforming the Dresden Opera. He became more and more dissatisfied with his position, and when, in 1849, the revolution broke out, he foolishly joined the insurgents. The result was that he had to seek safety in flight; his companions were caught and imprisoned, while he succeeded in reaching Weimar, where Liszt took care of him and provided him with the means of escape to Switzerland. In that home of political refugees he dwelt during most of the years—more than a decade—that he was exiled from Germany. For six years he composed no more operas, devoting his time to writing essays on musical and dramatic subjects by way of explaining his theories. Little attention was paid to these, and he might have starved but for the assistance of Liszt and other friends. All this time the plans for his great 'Nibelung Tetralogy' were slowly maturing in his mind. In 1852 the poems were finished and printed and on 1 Nov. 1853, he began to write the music for 'Rheingold'; it was finished the following year and 'Die Walküre' was completed by March

1856. In the meantime he had unwisely accepted an offer to conduct a series of Philharmonic concerts in London (1855). Queen Victoria and the public were kind to him, but the press treated him shamefully, his music being described as an "inflated display of noise and extravagance," as void of melody, etc. He got only \$1,000 for four months' work. Returning to Switzerland, he finished 'Die Walküre' and began the third opera of the Nibelung Tetralogy, 'Siegfried.' When he had got to the middle of the second act, he despaired of ever finishing and producing this great cyclic work, and so abandoned it for the time being (in June 1857) and began his 'Tristan und Isolde,' which, being a separate work, would, he hoped, re-establish his connection with the stage. He completed it in 1859, but seven years elapsed before he succeeded in producing it. In 1860 he gave a series of concerts in Paris; they resulted in a large deficit. In the following year Napoleon ordered a performance of 'Tannhäuser.' Wagner was given to understand that he must introduce a ballet in the second act; he refused to do so, and the members of the Jockey Club took their revenge by creating such a disturbance that Wagner refused to allow more than three performances to be given. He thus received only \$150 for a year's hard work. Immediately after this disaster he wrote the poem for his only comic or humorous opera, 'Die Meistersinger,' of which he had made a sketch as early as 1845.

It was while composing this opera that the most important event of his life happened. He seldom had much money, but when he had he spent it with artistic lavishness, nor did he hesitate to live beyond his means. The failure, through no fault of his, of a Russian concert project, left him so deeply in debt in Vienna, that, to escape prison, he had to hide in Germany. On 3 May 1864, he was preparing to disappear in the Swabian Alps, there to complete his 'Meistersinger' score, when a message arrived from the new king of Bavaria, Ludwig II., who invited him to come to Munich to live there at his expense, to compose operas, and produce them. Wagner wept for joy, and promptly proceeded to Munich, where 'Tristan und Isolde' was produced on 10 June 1865, and 'Die Meistersinger' on 21 June 1868. But Wagner's enemies made life so unpleasant for him that he left Munich and took up his abode in a villa on Lake Lucerne, where, after completing his comic opera, he took up 'Siegfried' and finished that (1869). The fourth and last opera of the Tetralogy, 'Götterdämmerung,' was not completed till 1874. His plan of having a special theatre for the Tetralogy built in Munich, having failed, notwithstanding the king's friendship, he now chose Baireuth as the best place for such a theatre, in which his novel work could be presented in exact accordance with his intentions. To secure the large sum needed, Wagner societies were founded in the cities of Europe and America. In August 1876, three complete performances of the Tetralogy were given, before audiences including two emperors, a king, and many musical and other celebrities. But the deficit of \$37,000 discouraged a repetition of the festival. In 1882, however, after the completion of 'Parsifal,' another was held devoted entirely to that work; 20 performances were given in July and August. In the following February,

Wagner died at Venice and his remains were taken in a special funeral train to Baireuth. After his death his widow (Cosima, the daughter of Liszt, whom he had married in 1870, four years after the death of his first wife) continued the festivals, which soon became enormously profitable. 'Parsifal' remained a Baireuth monopoly until 24 Dec. 1903, when Manager Conried produced it at the Metropolitan Opera House, New York, the receipts being over \$200,000 for 12 performances.

In personal appearance Wagner was barely of medium stature; his head was large in proportion to his body, his forehead massive, his chin prominent, his lips refined, his eyes keen, yet kindly in expression. His life was full of disappointments, which left their traces in the lines of his face. He was 44 years old before any of his operas were heard in Vienna, Munich or Stuttgart, and 56 before any of them were sung outside of Germany. This, of course, was largely due to the fact that he refused to make any concessions to popular taste, except in 'Rienzi.' The next three operas—'Flying Dutchman,' 'Tannhäuser,' and 'Lohengrin'—created an entirely new style, and by the time the public had become accustomed to that, he made another equally great step forward in his 'Tristan,' 'Meistersinger,' 'Nibelung Tetralogy,' and 'Parsifal.' These were derisively referred to as 'music of the future,' by way of burlesquing his idea of the 'art work of the future.' This idea was that music, sculpture, poetry, painting, and architecture had had their day as separate arts, and that the art work of the future was the music-drama, in which all these arts are united inseparably. His wonderful pictorial imagination is best exemplified in 'Parsifal.' Being almost as great a poet as he was a composer, he always wrote his own librettos, whose theatric and literary merits place him among the world's greatest playwrights, although they must not be judged apart from the music any more than the music must be judged apart from the plot, the scenery and the action. He preferred mythical, supernatural subjects to the historic. His operas are not, like those of his predecessors, a mere mosaic of unconnected arias, duos, choruses, and orchestral interludes, but, especially in those of the last period, every part is connected with every other part by means of leading motives, or characteristic musical phrases which are associated with a particular person, incident, or dramatic emotion, and which recur in the music whenever the person or dramatic idea with which they are associated recurs in the play. This practically gives the faculty of definite speech to the orchestra, the beauty and emotional power of which he further enhanced beyond all precedent by an endless variety of new tone colors and expressive harmonies. He also created an entirely new style of dramatic vocalism, which it took the singers years to master, but with which they are now celebrating their greatest triumphs; to-day Wagner's operas are more popular and profitable than any others. Apart from his operas, the list of Wagner's works includes some mediocre piano-forte pieces, several good songs, and, for orchestra, the 'Siegfried Idyll,' and three marches, the 'Huldigungsmarch,' the 'Kaisermarch,' and the 'Philadelphia Centennial.' This last, like his other miscellaneous works, is mediocre. His

literary works comprise ten volumes of dramatic poems and essays on musical and philosophical subjects, some of them wordy and wearisome, others extremely keen and suggestive; English version by Ellis, who is also translator of Glasenapp's monumental biography in 5 or 6 vols. The letters of Wagner to Liszt and other friends are extremely valuable; full use is made of them in the most elaborate biography in the English language, by Finck (1893). Other biographic and critical books are by Julien (1886), Tappert (1883), Muncker (1891), Liszt, Wolzogen (1883), Pohl, Nohl, Forges, Hoeffer, Chamberlain (1892), Nietzsche, Schuré, Kufferath, Oesterlein, Dannreuther (in Grove), Henderson (1901), Krebbs (1891), Kobbé, Newman, Weissheimer; thematic guides by Wolzogen, Kobbé, Heintz, Freda Winworth.

HENRY T. FINCK,

Musical Director New York 'Evening Post.'

Wagner, Rudolf, German physiologist: b. Baireuth, Bavaria, 30 July 1805; d. Göttingen, Germany, 13 May 1864. He was educated at Erlangen, Würzburg, and at Paris, was appointed professor of zoology at the University of Erlangen in 1833, and in 1840 was called to that chair at the University of Göttingen, where he remained until his death. He published: 'Lehrbuch der vergleichenden Anatomie' (2 vols., 1834-5); 'Handwörterbuch der Physiologie' (4 vols., 1842-3); 'Vorstudien zu einer wissenschaftlichen Morphologie des menschlichen Gehirns als Seelenorgans' (2 vols., 1860-2); etc.

Wagner, Siegfried, German musical conductor, son of Richard Wagner (q.v.): b. Lucerne, Switzerland, 6 June 1869. He was intended for an architect, but being bent on adopting the profession of his father, he left the Polytechnic school and studied music under Kniese and Humperdinck. He became a musical conductor in 1893, traveling in this capacity on the Continent and in England, and in 1896, and again in 1899, conducted the performances of 'Der Ring des Nibelungen' at Baireuth. He is the composer of the operas 'Der Bärenhäuter' to his own text (1899), and 'Hörner Wildfang' (1901); and various orchestral pieces.

Wagon, a four-wheeled vehicle for the transport of goods or passengers, drawn generally by horses. To enable the vehicle to turn as quickly and in as little space as possible, the fore pair of wheels are often made smaller than the hind pair, and to increase this advantage still further the axle of the fore-wheels is frequently fixed to the bottom of the vehicle by a swivel joint, in which case the shafts are attached to the fore-axle. The framework of the wagon is usually mounted on springs.

Wagram, vä'grām, Austria, a village on the left bank of the Rossbach, 12 miles north-east of Vienna, famous for the great battle between the French under Napoleon and the Austrians under the Archduke Charles, on 5 and 6 July 1809. Napoleon had obtained reinforcements after the severe loss which he sustained at Aspern and Essling, and was able to throw an army of 150,000, with 550 cannon, across the Danube on 5 July. The Austrians, who occupied a strong position at Wagram, were immediately attacked, but the first day with little success. On the following morning the archduke fell upon the French centre under

WAGTAIL—WAHIAKUM

Masséna, and then upon their left, producing confusion ending in total rout. A successful attack upon the Austrian left and centre by Davoust and MacDonald compelled the archduke to retreat, which he did leisurely and in good order, carrying with him about 7,000 prisoners, but leaving behind him 25,000 dead and wounded on the field, the French loss being probably about equal. On the 12th an armistice was signed at Znaim, and negotiations were commenced for a peace, which was concluded on the 14th October at Schönbrunn, and by which Austria ceded all her seacoast to France; Bavaria and Saxony were enlarged at her expense; part of Poland in Galicia was given to Russia, and Joseph Bonaparte was acknowledged king of Spain.

Wagtail, a small passerine bird of the family *Motacillidae*, so called from the habit of jerking the long tails when running or perching. In this family, which also includes the pipits (*Anthus*) or titlarks (q.v.), the bill is slender, straight, and notched at the tip; the tarsi very long and slender for a passerine bird; the wing with nine primaries and elongated inner secondaries, and the tail long. About 100 species are known, most of them belonging to the Old World. North America has four species of pipits and three wagtails, one of which (*Budytes flavus*) is abundant in Alaska, the others (*Motacilla alba* and *M. ocularis*) are stragglers from Europe and Asia, respectively. The wagtails inhabit meadow-lands and pastures, and frequent pools and streams. They are agile runners, and have an easy, undulating flight. The food consists of insects, worms, snails, etc., especially such as may be found by wading. Their nests, built on the ground, contain from four to six eggs. A well-known European species is the pied wagtail (*Motacilla yarrelli*), a permanent resident in Great Britain. The white wagtail (*M. alba*) is common in France and southern Europe, is widely distributed in Asia, and occasionally wanders to Greenland; it resembles the preceding species, but is rather slender in form, and has the throat and part of the head and neck alone black, the general color of the upper parts being of a light ash gray. The blue-headed wagtail (*Budytes flavus*) is about 6½ inches long, yellowish green above, bright yellow below, the head bluish gray except for the yellow throat and white superciliary stripe. This species is distributed extensively over Europe and Asia, and breeds plentifully in Alaska. The nest is formed of roots and moss sometimes lined with feathers, and placed in a hollow on the ground. The name of water wagtail, sometimes applied to the pied wagtail in England, is in the United States often given to the water-thrush (*Seiurus noveboracensis*), one of the warblers (q.v.).

Consult: Dresser, 'Birds of Europe'; Seebohm, 'Birds of Asia'; and the writings of Nelson, Turner, and Murdoch on the ornithology of Alaska.

Wah, the Nepalese name of the panda (q.v.).

Wahabees, wā-hā'bēz, **Wahabia**, or **Wahabites**, a Mohammedan sect, founded in Arabia about 1745 by Abd-el-Wahāb, a merchant as well as an oriental scholar of high attainments, who could not help observing the corruption both in doctrine and in practice

prevalent among the professed sons of Islam, especially the Turks. He deemed it his mission, not to teach a new religion, but to purge the innovations and errors which had crept into the old faith, and to restore the doctrines and observances to strict harmony with the teachings of the Koran and the Sunna. He inveighed against the idolatrous veneration for the Prophet and other saints, denying the intercession of saints altogether. He was an enemy to the gaudy decorations of the mosques and the rich dresses worn by the Turks, and strictly prohibited the use of tobacco. All who should oppose this reformation were to be destroyed by fire and sword. The first of Abd-el-Wahāb's important converts was the young and ardent chief Sa'ūd (or Saoud), who ruled over the little territory surrounding the fortified town of Derayah (or Dureeyeh), and who afterward became the son-in-law of the reformer. Abd-el-Aziz and Ibn Sa'ūd, the son and grandson of this chief, carried their arms to the utmost limits of the Arabian peninsula, subjugating and converting numerous tribes of Bedouins, and plundering the treasures of the mosques. The province of Nejed became the chief seat of their power, but Sa'ūd II. soon extended it over the greater part of Arabia, over which he administered justice in the manner of the caliphs. In 1803 he captured Mecca, and soon conquered Hejaz. The loss of the sacred city at last roused the Turks to action, and Mehemet Ali, pasha of Egypt, was appointed in 1804 to the task of crushing the fanatics. Nothing of importance, however, was done till 1812, when the Egyptians took Medina and drove the Wahabees out of Hejaz. In 1815 Ibrahim Pasha undertook an expedition to central Arabia to crush the power of the sect at once and forever; but it was not until 1818, after much hard fighting, that he fairly succeeded in dispersing the Wahabee forces and taking their capital, Derayah, which he laid in ruins. Abdalla, the son and successor of Sa'ūd, and some of his ministers, were made prisoners, and sent off to Constantinople, where they were executed. The Egyptians were not able to maintain the supremacy which they had acquired; gradually the Wahabees regained their influence in the centre of the peninsula; and soon after the death of Mehemet Ali, in 1849, the Egyptians gave up the struggle. Palgrave visited them in 1863, and Col. Pelly in 1865, and published the fact that the Wahabees, under the rule of Feysul, at once their emir (temporal ruler) and imam (spiritual chief), extended their sway over a wider territory than ever before, and threatened to control by their arms and influence the whole peninsula. Since 1870, however, their power has been on the decline. Numerous fanatical Mohammedan bodies, evidently allied to the Wahabees, have settled in India, and by their turbulence and conspiracies have caused great uneasiness to the British government. Consult: Palgrave, 'Travels in Arabia'; Hunter, 'Our Indian Mussulmans' (1876); Burckhardt, 'Notes on the Bedouins and Wahabys' (1834).

Wahkiakum (the name of a former chief). A tribe of the Chinookan stock of North American Indians, formerly living near the mouth of Columbia River, in Washington. They were originally a part of the Chinook tribe, but sep-

WAHL--WAILATPUAN INDIANS

arated in the latter part of the 18th century, under Chief Wahkiakum, whose name they afterward assumed. They were first noted by Lewis and Clark. A county in southwestern Washington bears their name.

Wahl, William Henry, American scientist: b. Philadelphia, Pa., 14 Dec. 1848. He was graduated from Dickinson College, Carlisle, Pa., in 1867, studied at the University of Heidelberg, and subsequently made a special study of mineralogy, geology, and chemistry. He was professor of physics and physical geography at the Central High School at Philadelphia in 1873-4; resident secretary at the Franklin Institute; and editor of the 'Journal' of Franklin Institute in 1870-4, and in 1876 became editor of the Philadelphia 'Polytechnic.' He was associate editor of the 'Engineering and Mining Journal' in 1878-80, editor of the New York 'Manufacturer and Builder' in 1880-2 and then resumed his former post at the Franklin Institute, which he still holds. He has published 'Galvano-plastic Manipulations' (1883); 'Preparations of Metallic Alloys' (1893); 'Historical Sketch of the Franklin Institute' (1894); etc.

Wahoo, wā-hoo', Neb., city, county-seat of Saunders County; on Cottonwood Creek, and on the Chicago, B. & Q. and the Fremont, E. & M. V. R.R.'s; about 45 miles west of Omaha. It is in a fertile agricultural region in which the principal products are wheat and corn. The chief shipments are wheat, corn, and live-stock. There are 11 churches, a high school, elementary schools, and a public library. The Luther Academy, under the auspices of the Evangelical Lutheran Church, was chartered in 1883. The three banks, two national and one state, had, in 1903, a combined capital of \$150,000 and deposits amounting to \$545,960. Pop. (1910) 2,168.

Wahoo. See WAHOO.

Wahow'pum ('willow people'), a small tribe of the Shahaptian stock of North American Indians, occupying the village of Hahau on the north bank of Columbia River, near the mouth of Olive Creek, in Klickitat County, Washington. They have never been officially recognized.

Wahpekute ('shoot among deciduous trees'), a division of the Santee of the Dakota confederacy of the Siouan stock of North American Indians. They are now officially regarded as 'Santees,' of whom there are 1,300 under the Santee Agency, Nebraska.

Wahpeton, wā'pē-tūn (*Wā'pē-tōng-wong*, 'dwellers among deciduous trees'). A division of the Dakota confederacy of the Siouan stock of North American Indians. Like the other Dakota tribes they lived largely by hunting and were noted warriors. There are now 1,030 Sissetons, 'cut-heads,' and Wahpetons under the Devils Lake agency, North Dakota, and 1,950 Sissetons and Wahpetons under the Sisseton agency, South Dakota, but the numbers of the individual tribes are not known. See McGee, 'The Siouan Indians,' 15th Rep. Bureau of American Ethnology, Washington, 1897.

Wahpeton, wā'pē-tūn, N. D., city, county-seat of Richland County; at the confluence of the Red River of the North and the Sioux Wood River, and on the Great Northern, the

Northern P., and the Chicago, M. & St. P. R.R.'s, opposite Breckenridge, Minn., and about 43 miles south of Fargo. It was settled in 1872 by M. T. Rich; became a village in 1881; and in 1884 was chartered as a city. The chief industrial establishments are flax fibre works, flour mills, machine shops, wagon factory, and lumber mills. It has grain elevators and lumber yards. The principal buildings are the county court-house, churches, and schools. There are eight churches. The educational institutions are the Red River Valley University, the State Academy of Science, the Lutheran Bible School, and public and parish schools. The three banks have a combined capital of \$160,000. The government is vested in a mayor and a council of six members elected biennially. About one half the population are Scandinavians, Germans, and Bohemians combined, the rest are American-born. Pop. (1910) 2,467.

F. FALLEY,
Editor 'Globe.'

Wahsatch (wā'sāch) Mountains, a range in Utah, the eastern boundary of the Great Basin, extending from the northern boundary of the State south nearly to the Colorado River. Several peaks are nearly 12,000 feet high; at the base and among the foot-hills are deep cañons. Silver in large quantities is found in these mountains. See also ROCKY MOUNTAINS; UTAH.

Waiam, wī'am (so called from their principal village), a small tribe of the Shahaptian stock of North American Indians, also known as Des Chutes, Wyams, etc. Their chief village was on the Columbia River, where Celilo now is. They took part in the Wasco treaty of 1855 and are now on Warmpring Reservation, Oregon.

Wailatpuan (wī'ē-lāt'poo-an) Indians (Wai'lētpu, plural of Wai'ēlet, 'one Cayuse man'), a linguistic stock of North American Indians, consisting of the Cayuse and Molala tribes. The former originally occupied the mountain country on the heads of Wallawalla, Umatilla, and Grande Ronde rivers in Oregon and Washington; the Molala resided on Molala Creek, west of the Cascades in Oregon. The former tribe bore a high reputation for intelligence and bravery, but on account of their fighting propensities, which led them to make constant war against the Shoshoni and other tribes to the west, they were never very numerous. In 1838 a Presbyterian mission had been established among them by Dr. Marcus Whitman, at the site of the present Whitman, Washington. In 1847 smallpox carried off a large part of the tribe, and the Indians, believing the missionaries to be the cause of it, attacked and destroyed the mission on 27 November, and killed Whitman and 13 others. In 1854 the Cayuse numbered 126, of whom there were but few pure-bloods, the majority being intermixed with Nez Percés and Wallawallas. Of the 374 so-called Cayuse now on Umatilla Reservation, Oregon (which they share with the Umatillas and Wallawallas), only a few retain their own language. This reservation was set aside in 1855. There are perhaps two dozen survivors of the Molala tribe on Grande Ronde Reservation, Oregon. See Mooney, 'Ghost Dance Religion,' 14th Rep. Bur. Amer. Ethnology, Washington, 1891.

Waikato, wīka-tō, New Zealand, the principal river of North Island, flows first into Lake Taupo, and then out of it north to Manakau harbor on the west coast with a total course of 170 miles. Mercer, Hamilton, and Havelock, are the chief towns along its banks. Between the Upper Waikato, Lake Taupo, Mount Ruapehu, and the west coast lies the mountainous and picturesque "King Country," occupied mainly by Maoris under their king, who till 1884 resolutely opposed the survey or settlement by Europeans of the lands within their *whenua* or frontier.

Wainwright, wān'rit, Thomas Griffiths, English art critic and forger: b. Chiswick October 1794; d. Hobart Town, Tasmania, 1852. He studied art in London, wrote art critiques for the 'London Magazine,' on which Lamb, Hood, Cunningham, Hazlitt, and De Quincey were at the time (1820-3) collaborators, and exhibited at the Royal Academy in 1821-50. In 1826 he forged an order on the Bank of England for £2,250, in 1837 was sentenced at the Old Bailey to transportation for life to Van Diemen's Land (Tasmania). He was also believed to have been concerned in several poisoning cases, to obtain money. He appears as Varney in Bulwer's 'Lacretia,' and Dickens' 'Hunted Down' was based on his career.

Wainwright, wān'rit, Jonathan Mayhew, American Protestant Episcopal bishop: b. of American parents, Liverpool, England, 24 Feb. 1793; d. New York 21 Sept. 1854. He was graduated at Harvard College in 1812; studied theology and took holy orders, and was rector of Grace Church, New York, 1821-34. He was rector of Trinity Church, Boston, 1834-8, and assistant in charge of St. John's Chapel, New York, from the last named year till November 1852, when he was consecrated provisional bishop of New York. He was one of the founders of the University of New York, and was considered one of the most eloquent American pulpit orators of his time. His publications include: 'Sermons on Religious Education' (1820); 'Lessons on the Church' (1835); 'The Pathway and Abiding Places of Our Lord' (1851); 'The Land of Bondage' (1852); etc.

Wainwright, Richard, American naval officer: b. Washington, D. C., 17 Dec. 1849. He was graduated from the United States Naval Academy in 1868, was promoted lieutenant in 1873, lieutenant-commander in 1884, and was executive officer on board the battleship Maine at the time of her destruction in Havana Harbor in 1898. In the war which followed he was in command of the Gloucester and took part in the naval battle at Santiago 3 July 1898, in which he destroyed the Spanish torpedo boats Furor and Pluton. He was superintendent of the Naval Academy in 1900-2 and in 1903 was assigned to the command of the Newark.

Wait, John Cassan, American lawyer and civil engineer: b. Norwich, N. Y., 4 June 1860. He was graduated from Cornell as a civil engineer in 1882, and from the Harvard Law School in 1891. In 1887-94 he was instructor and assistant professor at Harvard and in 1896-7 was in charge of the New York State canal improvements. He was associate editor of the 'Railroad Gazette' in 1894-5, assistant corporation counsel for the city of New York in 1900-3, and has published: 'Car Builders'

Dictionary' (1895); 'Engineering and Architectural Jurisprudence' (1897); 'Law of Contracts' (1901); 'Poems of Industry and Labor'; 'Calendar of Invention and Discovery' (1903); etc.

Waite, wāt, Morrison Remick, American jurist, 7th chief justice of the United States: b. Lyme, Conn., 29 Nov. 1816; d. Washington, D. C., 23 March 1888. He was graduated from Yale in 1837; studied law, and in 1838 moved to Ohio, where he was admitted to the bar in 1839. He began the practice of his profession in Maumee City, later moving to Toledo. In politics he was at first an active and influential member of the Whig party, and was elected to the Ohio State legislature in 1849; later he took part in the organization of the Republican party; was an ardent supporter of Lincoln; and was nominated for Congress in 1862, but failed of election. His national reputation dates from the time of his appointment by President Grant as one of the counsel to represent the United States before the tribunal for the consideration of the Alabama claims at Geneva; associated with him were Caleb Cushing and William M. Evarts, the latter a college class-mate. His reply to Sir Roundell Palmer, establishing Great Britain's liability for permitting the Confederate cruisers to coal in British ports during the Civil War, was considered a model of legal argument in its clear, direct, and logical presentation of the law and facts. In 1873 he was chosen by both political parties as a delegate from his county to the convention for revising the State Constitution of Ohio, and was made president of that convention. In the same year he was appointed chief justice of the national Supreme Court, the appointment being approved by a unanimous vote of the Senate. Many of the most important subjects of adjudication came before the court during his term of office. Among them were the following: The constitutionality of the enforcement act; interpretation of the latest constitutional amendments; rights and powers of the State to control and regulate the charges of railroads; the polygamy cases; federal control over elections; power of the president to remove from office; power of States to prohibit the liquor traffic; repudiation of State debts and the true meaning of the 11th amendment; questions arising out of the violence of the Chicago anarchists, and the exclusion of the Chinese. His work was marked by the strictest attention to detail, and by a rigid enforcement of the rules and precedents of practice of the court, it was his custom to keep watch of the docket and acquaint himself in advance with the character of the cases about to be reached. In all questions his decisions were entirely uninfluenced by political considerations; and all parties and sections united in commending his absolute fairness. A prominent lawyer of the South said of him: "He could hold in his steady and equal hand the balance of justice undisturbed."

Waits, the name formerly given in England and other countries to the king's minstrels, whose duty it was to guard the streets at night and proclaim the hour. The name was afterward applied to the town's musicians, who, however, did not perform the duties of watchmen; and to private bands, when employed as serenaders. At present the waits are musicians who play during the night hours on the approach

WAKASHAN INDIANS—WAKE FOREST COLLEGE

of the Christmas or New Year seasons, and call at the houses of the inhabitants for donations. While this custom exists to some extent in the United States, the term "waits" is not used here.

Wakashan (wā'ka-shān) Indians (from *Wakash*, the Nootka word "good," which, when heard by Capt. Cook, was supposed to be the tribal name), a linguistic stock of North American Indians, consisting of the Aht and Haeltruk divisions with their numerous tribes, occupying the northern half and the western part of the southern half of Vancouver Island, the opposite mainland of British Columbia, and a small area about Cape Flattery inhabited by the Makah, one of the Aht tribes. The stock has also been referred to as Nootka and Nootka-Columbian, the term Nootka being the first name applied to the Mowachat, an Aht tribe. Of the Aht division there are some twenty tribes, numbering in all about 3,100 individuals, of whom there are 414 Makah under the Neah Bay Agency, Washington, the remaining tribes being under the West Coast Agency of British Columbia. The 17 Haeltruk tribes number in all about 2,500 souls, of whom about 1,900 are under the Kwakweweth Agency, British Columbia.

Wakatipu, wā'ka-tē'poo, New Zealand, a picturesque lake in the South Island with an area of 112 acres. Queenstown and Glenorchy, on the borders of the lake, are favorite tourist resorts, on account of the magnificent mountain scenery in the vicinity.

Wakayama, wā'kā-yā'mā, Japan, a town on the island of Hondo, situated on the east coast of the channel leading into the eastern end of the Inland Sea, 35 miles by rail southwest of Osaka. It is an important centre of the cotton industry. Its noted features are the princely Kishu palace, and the beautiful temple of Kijimijdera said to have been founded in 770 A.D.

Wake, Charles Standland, American anthropologist: b. England 22 March 1835. He was educated at Hull College, England, has been prominently connected with various English and American anthropological societies, originated a system of color and musical-tone relations and is at present connected with the Field Columbian Museum in Chicago. He has written: 'Chapters on Man' (1862); 'The Evolution of Morality' (1878); 'The Origin and Significance of the Great Pyramid' (1882); 'The Development of Kinship and Marriage' (1889); 'Serpent Worship and Other Essays' (1885); 'The Geometry of Science' (1899).

Wake, William, English prelate: b. Blandford, Dorsetshire, 26 Jan. 1657; d. Lambeth 24 Jan. 1737. He was graduated from Oxford, took orders in the Anglican Church in 1676, and in 1688 he became preacher at Gray's Inn. In 1689 he was appointed chaplain in ordinary to William and Mary, and also received a canonry of Christ Church, Oxford. From 1693 to 1706 he was rector of Saint James', Westminster, became canon residentiary and dean of Exeter in 1703, from 1705 to 1716 he was bishop of Lincoln. In 1716 he was enthroned archbishop of Canterbury. He took part in negotiations during 1717-20 for the union of the Anglican and the Gallican churches, and in his

relations with Nonconformists showed a liberal spirit. His chief works are: 'The State of the Church and Clergy of England in their Councils, Synods, Convocations, Conventions, and their other Assemblies, historically deduced' (1703); 'The Genuine Epistles of the Apostolical Fathers' (1693); and 'Principles of the Christian Religion in a Commentary on the Church Catechism.'

Wake, a term corresponding originally to *vigil*, and applied to an annual festival held on the anniversary of the day on which the parish church was consecrated and dedicated to a saint, the celebration being begun on the preceding day (the eve or vigil). On the eve of the anniversary the parishioners attended service in the church, the floor of which was strewn with flowers and rushes, and the altar and pulpit were decorated with boughs. Tents were planted in the church-yard to supply the people from surrounding parishes who crowded in on the morrow, that day being observed as a holiday. They soon degenerated into mere country fairs, and were long characterized by wild riot and licentiousness. Statutes were at various times directed against holding markets in churchyards and showing all goods except necessary refreshments on the great church festivals, but they seem to have been little regarded. Country wakes on some saints' festivals are still kept up in certain English parishes.

A *lyke* or *liche wake* (Anglo-Saxon, *lic*, a corpse) is the watching of a dead body by night by the relatives and friends of the deceased. The custom arose no doubt from the dread of remaining alone all night in the presence of the dead or from the fear that malignant spirits would interfere with the corpse. The practice, once general, is now confined in the United States, to a part of the foreign element, and is on the decline with them. Wakes are sometimes attended by scenes of disorder and intoxication, but as a rule they are conducted with decency, and show sincere respect for the dead.

Wake Forest College, located at Wake Forest, N. C., 16 miles northeast of Raleigh. It was chartered in 1833 as the Wake Forest Institute, under the auspices and control of the Baptists of the State; it was first opened to students in 1834, and in 1838 the charter was amended, its privileges enlarged, and the name changed to Wake Forest College. The greater part of the endowment was lost during the Civil War, but the college continued its work and regained its financial prosperity. The system of independent "schools" is now an established feature of the college organization; these schools are 15 in number, as follows: Latin, Greek, English, modern languages, mathematics, astronomy, chemistry, biology, physics, moral philosophy, history and political science, the Bible, pedagogy, law, and medicine. There are preparatory courses offered in Latin, Greek, mathematics and English. The college confers the degree of A.B., B.S., LL.B., and A.M. (for graduate work). In the A.B. and B.S. courses a part of the work is elective, the electives being somewhat limited, however, in accordance with the degree to be obtained. For the degree of LL.B. the full course in the School of Law must be completed, also the course in the School of History and Political Science. Students are admitted to the School of Medicine, either as

WAKE ISLAND—WAKEFIELD

medical students or as undergraduates, if taking the B. S. course. The completion of the course admits to the third year of any good medical school. With the aim of encouraging ministerial education, it has been the custom of the college to organize a special class, studying different phases of pastoral work or theology, this is outside the regular work of the School of the Bible, and does not count toward a degree; a pastors' course of one month was inaugurated in 1902 for those pastors who could obtain a month's leave of absence from their churches. The college has a pleasing location on high ground; its buildings include the main building, the Heck and Williams Building (library), the Wingate Memorial Building (chapel and audience hall), the Lea Laboratory (chemistry) and the Gymnasium. The productive fund in 1910 was over \$345,000; the library contained 23,000 volumes, the students numbered 379, and the faculty 34.

Wake Island, an islet of rock in the Pacific Ocean, lying 1,550 miles northeast of Guam, and 3,000 miles east of the eastern coast of Luzon, Philippines. It belongs to the United States as a Pacific outpost of the Philippine Archipelago. It is about one square mile in area, and its importance is due to the fact that it is on the cable route between the United States and the Philippines.

Wakefield, Edward Gibbon, English colonial statesman: b. London 20 March 1796; d. Wellington, New Zealand, 16 May 1862. Educated at Westminster School and Edinburgh High School, he became associated in a subordinate capacity with the legations at Turin and Paris. About 1826 he turned his attention to colonial affairs and worked out the scheme of colonization usually known by his name. Its cardinal features were the abolition of free grants of land for agricultural purposes (then so readily obtained that none cared to remain dependent, and laborers were at once transformed into landed proprietors); and the careful control of emigration. His views were first publicly expressed in 'A Letter from Sydney' (1829). The National Colonization Society was founded in 1830 to carry out his ideas, and in the following year his plan was adopted by the government for New South Wales. The South Australian Association was formed in 1834, and included many eminent men, and under its auspices the colony of South Australia was founded in 1836 on Wakefield's principles. He accompanied Governor-General Lord Durham to Canada in 1838 as adviser, and had an important share in drawing up the report in which Durham embodied his proposals for settling the Canadian difficulty. Wakefield was the moving spirit behind the New Zealand Association of 1837, which forced the British government to annex New Zealand. He was subsequently a prime mover in founding the Anglican settlement in New Zealand, and in 1852 he went to New Zealand and plunged into colonial politics. After the breakdown of his health in 1854 he lived in retirement till his death. All subsequent English colonial development has followed the ideas formulated by Wakefield. He was equally able as a theorist and a director of practical details. Consult. Rusden, 'History of New Zealand' (1883); Gisborne, 'New Zealand Rulers and Statesmen' (1892); Garnett,

'Life' in 'Builders of Greater Britain' series (1898).

Wakefield, Gilbert, English clergyman and controversialist: b. Nottingham 22 Feb. 1750; d. London 9 Sept. 1801. He was educated at Cambridge, took orders, but renounced the Anglican communion after holding two curacies, was classical tutor in nonconformist academies at Warrington (1779-83), and Hackney (1790-1). He was imprisoned two years in Dorchester jail for a so-called seditious libel in answer to Bishop Watson, for which his political friends consoled him with a gift of £5,000. He published editions of Bion and Moschus, Vergil, Horace, and Lucretius; 'Christian Writers of the First Three Centuries on the Person of Christ' (1784), left unfinished; 'Inquiry into the Expediency and Propriety of Social Worship' (1791), the necessity for which he denied; 'An Examination of Paine's Age of Reason' (1794); 'Silvia Critica,' a collection intended to illustrate the Scriptures from the stores of profane learning (1789-95). He was a man of wide learning, but although very amiable in ordinary life extremely bitter as a controversialist. After leaving the Church of England he never attached himself to any other religious society, although practically a Unitarian. Consult his autobiography, entitled 'Memoirs' (1792).

Wakefield, England, an episcopal city, in Yorkshire (West Riding), on the river Calder, nine miles south by east of Leeds. The cathedral of All Saints, founded 1329, is mainly in the Perpendicular style, with a lofty tower and spire, though including work of earlier and later dates. Saint Mary's Chantry, on the ancient bridge across the river, is a decorated structure of the time of Edward III., restored in 1847. Besides several other places of worship, the chief buildings and institutions of the town include: the town-hall, a fine building in French Renaissance style; a large corn-exchange; a market-house and an industrial and fine art institution (1890), containing a museum, laboratory, and lecture-room. The industrial establishments comprise woolen-mills, soap and artificial-manure works, iron-foundries, boiler-works, agricultural implement manufactories, wire-rope works, machine-works, corn-mills, malting-works, breweries, etc. There are many collieries near the town, and market-gardening is carried on in the vicinity. The trade, especially in corn, is very extensive, and is facilitated by railway connections as well as by the river Calder and canals. Wakefield is mentioned in 'Domesday Book.' It was the scene of a Yorkist defeat in the Wars of the Roses on 31 Dec. 1460. In 1888 it was made the seat of a bishopric, formed mostly out of the diocese of Ripon.

Wakefield, Mass., town in Middlesex County; on the Boston & Maine Railroad; about nine miles north of Boston. It is surrounded by farms, and it has several manufactories, chief of which are iron and brass foundries, piano factory, rattan goods works, shoe factory, flour mill, and machine-shops. In 1909 (government census) Wakefield had 23 manufacturing establishments, capitalized for \$3,846,000. The raw material used each year cost \$2,835,000, and the value of the annual products was \$2,692,000. The town contains the villages of Greenwood, Montrose, and Wakefield, in each of which are graded schools. There is one high school and

a public library containing about 15,000 volumes. There are two banks: the national bank has a capital of \$100,000 and \$444,270 in deposits; the savings bank has deposits amounting to over \$1,050,000. Pop. (1910) 11,404.

Wakefield, R. I., village in Washington County; at the head of Point Judith Inlet, an arm of the Atlantic Ocean, and on the Narragansett Pier Railroad; about 30 miles south by west of Providence. It is in a part of the State devoted to farming and market-gardening. The village has cotton and woolen mills, and several small industries. It has a savings bank and a trust company. Pop. (1890) 2,200. In 1910 the population was included with that of South Kingston town, which had a total of 5,176.

Wake'man, Henry Otley, English historian: b. near Worcester 25 Sept. 1852; d. Basel, Switzerland, 27 April 1899. He was educated at Christ Church, Oxford, was a fellow of All Souls from 1877 to his death, and was admitted a barrister of the Inner Temple in 1877. His publications are: 'The History of Religion in England' (1885); 'What Has Christianity Done for England?' (1886); 'The Church, and the Puritans, 1570-1660' (1887); 'Europe, 1598-1715' (1894); 'Introduction to the History of the Church of England from the Earliest Time to the Present Day' (1896; 5th ed. 1898); and an edition (with Hassall) of a volume of 'Essays Introductory to the Study of English Constitutional History' (1887).

Wakeman, Thaddeus Burr, American philosopher: b. Greenfield Hill, Conn., 23 Dec. 1834. He was graduated from Princeton in 1854, and was admitted to the bar in 1856. He has translated Goethe's religious poems, and has made a specialty of the study of positive philosophy. He is president of the Liberal University of Kansas City, and has published: 'An Epitome of Positive Philosophy'; 'Liberty and Purity' (1881); 'Evolution or Creation'; etc.

Wake'manites, certain fanatics who were supposed to be harmless until they committed a murder at New Haven, Conn., in 1855. Their leader was an old woman named Rhoda Wakeman, supposed to have been insane. Her followers obeyed her as a prophetess and believed she had been raised from the dead. At her bidding they murdered a farmer, Justus Matthews, who, she said, was possessed by an evil spirit. The unfortunate man willingly submitted to the sentence pronounced by the old woman, but the authorities prevented further tragedies by taking prompt action against all concerned in the crime, and the sect became extinct.

Walam Olum, otherwise known as the "Red Score" of the Lenni Lenape or Delaware Indians, and supposed to be a record of the migrations of the tribe. The word "Olum" signifies a record, and "Walam," painted. Red is the color used. "Olum" was commonly applied to a notched stick, an engraved piece of wood or bark; but it is not unlikely that the engraved stone gorgets, notched along all their edges, or partly so, are to be included as records. The notching is too inconspicuous to be considered as ornamentation, but is so cleanly cut and defined that some serious purpose was evidently in mind in making it. The historic

"Walam Olum," for which we are indebted to Rafinesque, is declared by Antony, a Delaware Indian, to be a genuine composition of a member of that tribe. This composition, or record of events during the wanderings of the people, is asserted by Brinton to be "not of foreign origin, but wholly within the cycle of the most ancient legends of that stock"—the Algonquin. If read aright, it is a record of wanderings from the Labrador region southward and westward, and again eastward to the Atlantic coast of the middle United States. As a record of a migration that was possibly more extensive and fateful to these people than any one other of which they had knowledge, too much value has been placed upon it. Those ethnologists who have strongly leaned to the extreme modernity of man in America have thought they found evidence therein that the whole Atlantic seaboard, and for many leagues inland, was uninhabited and had so remained for all time until this wandering, described in the Walam Olum, took place. This conclusion does not seem to be supported by the results of geological research. Entirely too much has been made also of the assumption that the migration of the Lenni Lenape, supposedly described in the "Walam Olum," was their only one.

Walcheren, vâl'xér'ën, Netherlands, an island in the province of Zeeland, at the mouth of the Scheldt, forming an irregularly-shaped circle about 11 miles in diameter. It is well wooded and has fertile meadow lands, yielding corn and other crops in great plenty. Fruit is abundant. It contains the towns of Flushing, Middleburg (the capital), and Veere. It is protected from the sea by strong dikes. The island is noted for the Walcheren expedition of 1809, one of the most complete failures in British military history. The second Earl of Chatham, eldest son of the great Chatham, was despatched to the island in command of a force of about 40,000 for the purpose of capturing Antwerp and destroying Napoleon's arsenals on the Scheldt. Instead, however, of pressing forward against Antwerp, he persisted in the siege of Flushing, which was not captured before the greater port had been reinforced and strongly fortified by the French. Chatham returned to England with the bulk of his force, leaving a garrison of 15,000 on the island of Walcheren. The garrison was attacked by marsh fever and other diseases, about one half dying, and over half of the remainder being permanently disabled. Orders were then received from the government to destroy Flushing and return home.

Walckenaër, vâl-ké-nâr', Charles Athanasé, BARON, French savant and author: b. Paris 25 Dec. 1771; d. there 27 April 1852. At 17 he went to study at Glasgow and Oxford; served as director of transportation in the army of the Pyrénées in 1793; became mayor of Paris in 1816, and prefect of the department of Nièvre in 1824 and of Aisne in 1826. In 1830 he finally left the public service, and in 1840 he became perpetual secretary to the Academy of Inscriptions. He was a voluminous writer on very many subjects. His first publication was an 'Essai sur l'histoire de l'espèce humaine' (1798), and in 1802 he published an 'Histoire abrégée des insectes des environs de Paris' and in 1805 a 'Tableau des aranéides,' an important

contribution to entomology. Among his remaining works may be cited: 'Le monde maritime' (1819); 'Nouvelle collection des relations des voyages' (21 vols., 1826-31); 'Analyse géographique des itinéraires des anciens' (1839); 'Histoire de la vie et des poésies d'Horace' (1840); 'Mémoires sur Madame de Sévigné' (1842-52), which he left incomplete.

Walcott, wôl'kôt, Charles Doolittle, American geologist: b. New York Mills, N. Y., 31 March 1850. He made a special study of geology, and in 1876 became assistant State geologist of New York. He was appointed to a like office in the United States geological survey in 1879, became paleontologist in 1883, chief paleontologist in 1891 and in 1893 was appointed geologist in charge of geology and paleontology, and director of the geological survey in 1894. He was acting assistant secretary of the Smithsonian Institution in 1897-8, on 23 Jan. 1907 he was elected secretary, and in 1902 was elected chairman of the board of trustees for the National University founded by Andrew Carnegie. He has made a specialty of Cambrian researches and in 1888 laid the results of his labors before the International Geological Congress in London. His writings include: 'The Trilobite' (1881); 'The Cambrian Faunas of North America' (1885); 'The Taconic System of Emmons' (1888); 'The Fauna of the Lower Cambrian or Olenellus Zone' (1890); 'Correlation Papers, Cambrian' (1891); etc.

Waldeck, vâl'dêk or wôl'dêk, Germany, a principality consisting of two distinct portions, Waldeck proper and Pyrmont. Waldeck proper, with an area of 407 square miles, is enclosed by the Prussian provinces of Westphalia and Hesse-Nassau; and Pyrmont, with an area of 25 square miles, is enclosed by Prussia, Brunswick, and Lippe. Both sections are mountainous, and belong to the basin of the river Weser. Waldeck proper is nowhere much under 600 feet above sea-level, and in the western region, known as Upland, it attains in the Ettelsberg an elevation of 2,726 feet. Much of the soil is unsuited for agriculture, but some parts, such as the lower valley of the Eder and the northeast of Waldeck proper, are fairly fertile. The chief industries are agriculture and the rearing of cattle, sheep, pigs, and other animals. Manufactures are of small extent: the most important are tobacco and cigars (Pyrmont), liqueurs (Arolsen), and machines (Wetterburg). There are ironstone mines at Adorf. The constitution bears date 17 Aug. 1852. The princely dignity is hereditary according to primogeniture in the male line, but on the extinction of the male line is falls to the female line. The Diet consists of 15 members elected indirectly for three years. By the Treaty of Accession of 1867, renewed in 1877 and 1887, the internal administration is carried on by a Landesdirektor appointed by the Prussian government with the approval of the prince. Its courts of justice are subject to those of Cassel and Hanover, and its troops form a battalion of a Prussian infantry regiment. Arolsen is the capital and residential town. The Reformation was introduced under Count Philip IV. in 1526. The imperial field-marshal, George Frederick (1664-92), was the first of its rulers to assume the style of prince. In 1712 the ruler Anton Ulrich was created a prince of the empire. Waldeck supported Prussia

in the war of 1866, and entered the North German Confederation in the following year. The Treaty of Accession of 1867, which makes the prince a merely nominal sovereign, was the result of a desire expressed by the Diet for union with Prussia. Pop. about 40,000, of whom 9,000 are in Pyrmont. The inhabitants are nearly all Lutherans.

Waldeck-Rousseau, vâl-dêk-roo-sô, Pierre Marie, French statesman: b. Nantes 2 Dec. 1846; d. Paris 10 Aug. 1904. He studied law, was admitted to the bar at Nantes, was elected deputy for Rennes in 1879, and in 1881 was made minister of the interior in Gambetta's cabinet. This portfolio he held also with great success in the Ferry ministry of 1883-5, in 1886 was called to the Paris bar, and, though he continued to participate until 1889 in the debates of the Chamber of Deputies and in that year published a collection of 'Discours Parlementaires,' he then withdrew temporarily from public life and became one of the foremost of French advocates. His best known case was the defense of De Lesseps (q. v.) in the Panama canal matter. In 1894 he returned to politics as senator for the department of the Loire, in 1895 was an unsuccessful candidate for the presidency, and in 1899 was summoned by Loubet to form a ministry. On the second attempt he succeeded in assembling in support of the Republic a cabinet including such diverse elements as Millerand, the Socialist, and General de Gallifet, who had so severely put down the Commune in 1871. He himself took again the ministry of the interior, and during the second Dreyfus trial, the strikes at Le Creusot, the prosecution and condemnation of Déroulède, and other troubles, he suppressed the disorder hitherto prevalent and enforced a regard for the law. The Associations bill of 1901, by which he asserted the religious associations were for the first time made subject to the rules governing others, was the principal event of the latter part of his administration. At the general election of 1902, Republican victory was complete, and Waldeck-Rousseau, regarding his service as accomplished, resigned 3 June 1902. He had proved himself one of the strongest figures in recent French politics. He further published: 'Discours Prononcés dans la Loire' (1896); 'Questions Sociales' (1900); 'Associations et Congrégations' (1901); 'La Défense Républicaine' (1902). Consult Ernest-Charles, 'Waldeck-Rousseau' (1902).

Waldemar I., vâl'dê-mâr or wôl'dê-mâr (THE GREAT), king of Denmark: b. 1131; d. 1181. He succeeded Eric V. in 1147, was famous for his expeditions against the pirates of the Baltic, and successful in exacting from Magnus VI., king of Norway, a treaty which secured the pre-eminence of Denmark. **WALDEMAR II.** (the Victorious), younger son of the preceding, succeeded his brother Canute VI., in 1202. He made warlike expeditions into Sweden, Norway, and Germany, raised a powerful navy, and revised the laws of his kingdom. He died in 1241. **WALDEMAR III.**, eldest son of the preceding, was regent from 1219 to 1231. **WALDEMAR IV.**, third son of Christopher II., was in Bavaria at the death of his father in 1333. In 1340-4 he recovered part of his kingdom in war, and obtained some further successes against Sweden in 1353 and 1357; eventually, however, he was glad to obtain peace by large concessions.

Walden, wál'dén, John Morgan, American Methodist bishop: b. Lebanon, Ohio, 11 Feb. 1831. He was graduated from Farmer's (now Belmont) College, near Cincinnati, in 1852, and afterward engaged in teaching and in journalism. He was a member of the Topeka legislature in 1857 and a delegate to the Leavenworth constitutional convention in 1858, returning in that year to Ohio where he entered the Methodist Conference. He became minister in the Cincinnati Conference Methodist Church in 1858, was one of the publishing agents of the Methodist Book Concern in 1868-84, and in the last named year was elected bishop. He has traveled in every State in the Union and through Europe and Asia in making his episcopal visits.

Walden, Treadwell, American Episcopal clergyman: b. Walden, N. Y., 25 April 1830. He was graduated from the General Theological Seminary in 1853, took priest's orders in the Episcopal Church in 1856 and after holding charges in Newark, N. J., was rector of Christ Church, Norwich, Conn., 1857-63; Saint Clements, Philadelphia, Pa., 1863-8; Saint Paul's Cathedral, Indianapolis, 1869-72; Saint Paul's, Boston, 1873-6, and Saint Paul's, Minneapolis, 1882-5. He published: 'Lays of a Lifetime' (1856); 'The Sunday School Prayer Book' (1860); 'Privations and Sufferings of United States Officers and Soldiers in Confederate Prisons' (1864); 'Our English Bible and its Ancestors' (1870); 'An Undeveloped Chapter in the Life of Christ' (1882); 'The Great Meaning of Metanoia' (1896).

Walden, N. Y., village in Orange County; on the Walkill River, and on the New York Central & Hudson River railroad (Walkill Valley branch); 75 miles north by west of New York, and 13 miles northwest of Newburgh. The date of the first settlement is uncertain, but it was before 1768; the village was incorporated in 1855. It was first known as High Falls, owing to the fall of 40 feet in the river at this point. It is in an agricultural region, noted for its dairy products and in a valley famous for its picturesque scenery. It has large cutlery works, woolen mills, a soap factory, engine works, foundries, and machine shops. There are two banks, one of which is a national bank. Pop. (1910) 4,004.

Walden University, an institution for the education of the colored race, located at Nashville, Tenn. It grew out of a school for adults and children established by the Freedmen's Aid Society; in 1866 it was chartered as Central Tennessee College. It is under the control of the Methodist Episcopal Church. In 1900 the name was changed to Walden University in honor of Bishop John M. Walden. The university includes the following departments: (1) Collegiate department; (2) academic department (preparatory); (3) normal department; (4) commercial department; (5) law department; (6) Braden Bible Training School; (7) music department; (8) Meharry Medical College; (9) industrial department. The collegiate department offers two four years' courses, the classical and the scientific; and two corresponding preparatory courses of three years. The normal department offers a course five years in length (instead of four years, as formerly); the first three years are the same in rank as the college

preparatory course; the completion of this course entitles the student to the degree of bachelor of pedagogy. The academic department offers a two years' English course, and a two years' teacher's preparatory course. In all these courses the daily study of the Bible is required. The law department, which was the first law school for colored students established in the South, has a two years' course. The Braden Bible Training School offers a theological course, correspondence courses in theology, and a missionary and deaconess training course. The theological course is two years in length, with a year of post-graduate work; the missionary training course includes studies in industrial department and the medical school. The Meharry Medical College was founded in 1876; it offers a four years' medical course, which may be completed in three years by those holding an A.B. or B.S. degree; the dental college, the pharmaceutical college, and the nurses' training school are also a part of the medical department. The industrial department includes the trade schools, the school of domestic science and art, and the Walden Industrial School. The trade schools instruction and practice in carpentry, sloyd, painting, paper-hanging, calcimining, masonry and plastering, and landscape gardening for men, and in sloyd for women, the school of domestic science provides instruction in cooking, sewing, laundry work, etc., for women; the industrial school is for the industrial training of children, and serves also as a model school for normal department. When the students attain sufficient proficiency in industrial classes, work is furnished them by which they may pay a portion of their expenses. The students maintain two literary societies. The university buildings (1910) on the campus include the administration building, seven other brick buildings, and seven wooden buildings; the medical college is located in another part of the city. The library in 1910 contained 5,600 volumes; students of the law department also have access to the State Law Library. The students in 1910 numbered 801, of whom about 350 are in the medical department. Many of the graduates are teachers; and others are successful doctors and lawyers.

Waldenses, wöl-dén'séz. This mediæval sect owes its origin and name to Peter Waldo (Waldo), a rich citizen of Lyons, although some of their writers derive the appellation Waldenses from *vallée* (valley), and called them *l'oudous*, or dwellers in the valleys, whilst others have traced their origin to the earlier sects of Henricians and Cathari. About 1170 Waldo, shocked and moved to repentance for his sins by the sudden death of a friend, came to the determination to imitate the mode of life of the apostles and primitive Christians, gave his goods to the poor, and by his preaching collected numerous followers, chiefly from the class of artisans, who, from the place of their birth, were denominated *Leonists*, or the poor of Lyons; *Sabatati* or *insabatati*, on account of their wooden shoes or sandals (*sabots*); *Humiliatists*, on account of their profession of humility, and were often confounded with the Cathari, Patarènes, Albigenses, and others, whose fate they shared. Their chief strongholds were, and still are, in the mountain tract of the Cottian Alps, southwest of Turin. In their fanatical contempt of the clergy and their opposition to the Roman priest-

hood the Waldenses resembled other sects of like character in the Middle Ages; but, going beyond the design of their founder, which was merely to preach penance and a life of poverty, they made the Bible alone the rule of their faith, and rejecting whatever was not founded on it as not conformable to apostolical antiquity, they renounced entirely the doctrines, usages, and traditions of the Roman Catholic Church, and formed a separate religious society. They were therefore excommunicated as heretics at the Council of Verona in 1184, but they did not suffer a general persecution until the war against the Albigenses, whom they closely resembled in the extravagances of their doctrines and customs, after they had spread and established themselves in the south of France, under the protection of the counts of Toulouse and Foix. At that time (1209-30) many Waldenses fled to Aragon, Savoy, and Piedmont. In Languedoc they were able to maintain themselves till 1330; in Provence, under severe persecution, till 1545, when the parliament at Aix caused them to be driven out of the country, still longer in Dauphiny; and not until the war of the Cevennes were the last Waldenses expelled from France. In the middle of the 14th century single congregations of this sect went to Calabria and Apulia, where they were soon suppressed; others to Bohemia, where they were called Grubenheimer, because they used to conceal themselves in caverns. They soon became amalgamated with the Hussites; and from them the Bohemian brethren derive the apostolical consecration of their bishops. Their doctrines rest solely on the Bible, which, with some catechisms, they have in their old dialect, consisting of a mixture of French and Italian. In this language their worship was performed till their old *Barbes* (uncles, teachers) became extinct in 1603. They then received preachers from France, and since that time their preaching has been in French. These teachers, however, form no distinct priesthood, and are supplied from the academies of the Calvinistic churches. Their rites are limited to baptism and the Lord's supper, respecting which they adopt the views of Calvin. The constitution of their congregations which are chiefly employed in the cultivation of vineyards and in the breeding of cattle, and which are connected by yearly synods, is republican. Each congregation is superintended by a consistory composed of elders and deacons, under the presidency of the pastor, which maintains the strictest moral discipline, and adjusts small differences. After they had entered into a religious communion with the Calvinists, in the 16th century, they were also exposed to the storm which was intended to sweep away Protestantism, and this was the cause of their extirpation in France and their checkered fate in Piedmont. Those who had settled in the marquisate of Saluzzo were totally suppressed by 1633; and those in the other valleys, under the jurisdiction of the court of Turin, were subjected to severe persecution, often occasioned by their own aggressiveness. Aided by the mediation of the Protestant powers, they finally procured a new, though more limited, ratification of freedom by the treaty concluded at Pinerolo 18 Aug. 1655. The persecution exercised in 1685 through French influence obliged thousands to emigrate into Protestant countries, including the English col-

onies in North America. In London they united with the French Huguenots; in the Netherlands with the Walloons; in Berlin with the French congregations; and nearly 2,000 went to Switzerland. Some of these returned by force to Piedmont in 1680, and with those who had remained maintained themselves under many restrictions, to which an end was finally put in 1725 in consequence of Prussian mediation.

The Waldenses were not permitted to enjoy full religious freedom and civil rights until the establishment of the kingdom of Italy, but now they do so not merely in their old valleys of Lucerne, Perusa, and Saint Martin, but generally throughout Italy, and they have churches in Turin, Rome, Venice, and elsewhere. Their church service is under the direction of a synod. After long negotiations, in the way of which great difficulties were thrown by the opposition of the Tübingen theologians, several hundreds of the above-mentioned fugitives settled in Württemberg in 1699, where their descendants now form several parishes. They are next to the Calvinists in the simplicity of their worship and in their ecclesiastical constitution, but in intellectual cultivation are behind the other Protestants. (See REFORMATION, RELIGIOUS SECTS.) Consult: Léger, 'Histoire générale des églises évangéliques des vallées de Piémont ou Vaudoises' (1699); Dieckhoff, 'Die Waldenser im Mittelalter' (1851); Herzog, 'Die romanischen Waldenser' (1853); Melia, 'Origin, Persecution, and Doctrines of the Waldenses' (1870); Montet, 'Histoire littéraire des Vaudois du Piémont' (1885); Preger, 'Die Verfassung der französischen Waldenser in der älteren Zeit' (1890); Bompiani, 'Short History of the Italian Waldenses' (1897); Schaaff, 'Creds of Christendom' (1877-8).

Waldersee, vâl'dér-zé, Albert, Count von, German soldier: b. Potsdam, Prussia, 8 April 1832; d. Hanover 5 March 1904. He entered the Prussian artillery of the guard in 1850, and in 1866 was assigned to the general staff and promoted major. During the Bohemian campaign he was connected with the general headquarters, after the peace became a member of the staff of the 10th army corps, and in 1871, at the outbreak of the Franco-Prussian war, was made chief-of-staff to the Grand Duke of Mecklenburg-Schwern, commander of one of the divisions. Promoted colonel and commander of the 13th Uhlans, his subsequent advancement was rapid. In 1880 he became a general, in 1882 lieutenant-general, in 1888 general of cavalry. Upon von Moltke's resignation as chief of the general staff (1888), Waldersee was chosen as successor; and it was very generally believed that he would follow Bismarck in the chancellorship, for which, however, Count von Caprivi was selected. Waldersee became commander of the 9th army corps in 1891, in 1898 inspector-general, in 1900 field-marshal of the empire. At the time of the Boxer outbreak in China (see BOXERS) he was placed in command of the German forces in that country, and from 27 Sept. 1900 to 4 June 1901, by approval of the powers, commanded the allied armies there. His activities in China contributed largely to a speedy adjustment of difficulties, while he was at the same time successful in preserving harmony among the allies.

Waldis, Burkard, vâl'dis, German rhyming fabulist. b. about 1490; d. about 1557. He was a Franciscan friar, but on returning from a pilgrimage to Rome, embraced the doctrines of Luther. He wrote a charming drama in Low German, 'The Parable of the Prodigal Son'; translated the 'Psalter' into German verse; and wrote 'Æsopus,' a collection of about 400 rhymed fables and drolleries.

Waldmüller, Ferdinand, Austrian painter: b. Vienna 1793; d. 1865. He was very successful as a painter of peasant life, and also drew much of his inspiration from the life of childhood. Among his principal works are: 'Two Tyrolean Huntsmen Resting' (1829); 'Beggar Boy on the Bridge' (1830); 'Soup Day at the Convent' (1858); 'After School' (1841); 'Sunday Afternoon' (1846); 'Palm Sunday' (1855); and 'Evening Prayer' (1864).

Waldmüller, Robert, vâld'muhl-ler, pseudonym of Charles Edouard Duboc, a German poet and miscellaneous writer: b. in Hamburg 17 Sept. 1822; d. about 1857. His best work is 'Village Idylls' (1860). Other works are 'Travel Studies' (1860); 'Sorrow and Joy,' a romance (1874); 'Brunhild,' a drama (1874).

Waldo, wôl'dô, Daniel, American Congregational clergyman: b. Windham, Conn., 10 Sept. 1762; d. Syracuse, N. Y., 30 July 1864. He was drafted as a soldier in the army in 1778, and was arrested and captured by the Tories and carried to New York, where he was confined for two months, and then exchanged. After graduation at Yale in 1788 he studied theology, and in 1792 was ordained pastor of the Congregational Church in West Suffolk, Conn. Here he continued till 1809, when he resigned his charge, having for some time acted as a missionary in the States of Pennsylvania and New York. In 1810-11 he preached at Cambridgeport, Mass., after which he served as a missionary in Rhode Island till 1820, and was settled for 12 years at Exeter, Conn.; and afterward resided in the State of New York, without any stated charge. In 1855 he was made chaplain of the House of Representatives.

Waldo, Frank, American meteorologist: b. Cincinnati, Ohio, 4 Nov. 1857. He was graduated from Marietta College, Ohio, in 1878, subsequently studied at Harvard, and in 1882-3 was in Europe on United States government service. Upon his return to the United States he became instructor in astronomy at Radcliffe College, and was later engaged in teaching meteorology at the Corcoran School of Science, Columbian University. He afterward accepted the position of junior professor in the United States Signal Service, and has since become professor. He has published: 'Modern Meteorology' (1893); 'Elementary Meteorology' (1896); etc.

Waldo, Peter, French merchant: b. in the latter half of the 12th century; the date of his death is unknown. Waldo had acquired considerable wealth, when the sudden death of a friend turned his attention to spiritual things. He had translations made of portions of the Scriptures, which he read, and became convinced that he should lead a life of poverty. He gave part of his property to his wife and part to the poor, and began to preach his doctrines in the streets of Lyons. He advocated the study of the Scriptures by the individual Christian, and the right of laymen to teach.

This brought upon him the condemnation of the Church, and the archbishop of Lyons forbade Waldo and his followers to continue their teaching. They appealed to the pope, and at the Lateran Council in 1179 they were condemned. See WALDENSES.

Waldo, Samuel Putnam, American author: b. in Connecticut in 1780; d. Hartford, Conn., March 1826. He wrote: 'Narrative of a Tour of Observation by President Monroe' (1818); 'Memoirs of Andrew Jackson' (1820); 'Life of Stephen Decatur' (1821); 'Biographical Sketches of Nicholas Biddle, Paul Jones, Edward Preble, and Alexander Murray' (1823). He edited 'Journal of the Brig Commerce upon the Western Coast of Africa.'

Waldoboro, wôl'dô-bûr-ô, Maine, town, port of entry, Lincoln County; on the Medomak River, and on the Maine Central railroad; about 26 miles southeast of Augusta, and 18 miles west of Rockland. It was settled in 1749 by a colony of Germans, and in 1773 was incorporated. It is in an agricultural section. The chief manufacturing establishments are a shoe factory, machine shop, men's clothing factory, and creameries. Formerly the town was noted for its ship-building. The principal public buildings are the United States custom-house, the churches, schools, and the bank. Pop. (1910) 2,656.

Waldseemüller, Martin, the scholar who gave America its name. He was born at Freiberg, and his name was written in the school-list for the first time at that place 7 Dec. 1490. Assuming that this matriculation occurred when he was 8 or 9 years old, we have as the year of his birth 1481 or 1482. Equally conjectural is the year of his death. In 1522, L. Fries referred to him as deceased, and it has been supposed that the event was then recent. Certain it is that Waldseemüller was canon of St. Dié when he died, and that in the same Vosgian mountain town before 1507 he was regarded as an able young geographer by the little group of learned men there assembled. His 'Cosmographie Introductio' and his map of the world (the latter prepared as a globe also: '*sem in solido quam planis*'), both published at St. Dié in the year last mentioned, produced the effect described in our first volume (see AMERICA: a brief account of the derivation and meaning of the word). The name confidently proposed for the transatlantic lands, and at the same time actually conferred upon the new '*quarta orbis pars*,' in the little Latin treatise and on the huge wall-map and globe, was so promptly and generally caught up that its originator himself was powerless to recall it. When he issued his 'Carta Marina,' in 1516, he had changed his opinion as to the relative value of the achievements of Columbus and Amerigo Vespucci, for the word America does not appear on the map of 1516. But it was, fortunately, too late to impose a name less significant and less appropriate (see article mentioned above, and contrast the meaning of 'America' there given with that of 'Columbia,' that is, 'land of the dove'). Of the Waldseemüller map of 1507, 1,000 copies were printed, yet all were destroyed or lost long ago, and, indeed, the same fate had overtaken the Carta itineraria Europæ of 1511, and the Carta Marina of 1516. The Carta itineraria was the first to be recovered; the more interesting maps of 1507 and

1516 did not come to light until 1901, when their discovery created a sensation. In 'The Geographical Journal' for February 1902 we read: "Ever since Humboldt first called attention to the 'Cosmographie Introductio' no lost maps have ever been sought for so diligently as those of Waldseemüller. It is not too much to say that the honor of being their lucky discoverer has long been considered as the highest possible prize to be obtained among students in the field of ancient cartography. But until the last few months no specimen of either the globe or map has ever been seen or heard of in modern times. A few months ago the geographical world was suddenly startled by a brief announcement that Waldseemüller's long-lost map of 1507, together with another of his of 1516, had been found by Prof. P. Joseph Fischer of Feldkirch, in the library of Prince Waldburg at Wolfegg Castle." In the excellent work by Fischer and Wieser (see below) it is written that "Johann Schöner had the two Waldseemüller maps bound in the form of an atlas. To this circumstance we owe the preservation of the two precious cartographic monuments, while those copies that were mounted as wall-maps perished—as it seems, without exception—in consequence of their enormous size." In conclusion we would invite attention to two points: (1) The assertion so commonly made, that Waldseemüller intended to bestow the name America upon the southern continent only, appears at first sight to find support in the map of 1507, but is disproved by a comparison of the map with the explanatory passages in the 'Introductio'; (2) The Greek form of his own name on the map of 1516 is *Ilacomilus*, showing plainly his preference for that spelling toward the end of a rather short life. The fact that his name does not stand in any form upon the map of 1507 is additional evidence of juvenility. He appears to have been so young that his signature might have made good work seem less authoritative then. He was perhaps 25 years old when he produced a word that was to fill a place in all languages during all later ages.

Consult. Fischer and Wieser, 'Die älteste Karte mit dem Namen America'; Humboldt, 'Kritische Untersuchungen'; d'Avezac, 'Martin Hylacomylus Waltzemüller'; Harisse, 'Bibliotheca'; 'Decouverte,' etc.

MARRION WILCOX.

Author of 'History of War with Spain'; 'War in Philippines,' etc.

Waldstein, wald'stēn, Charles, American archaeologist: b. New York 30 March 1846. Educated at Columbia and Heidelberg universities he became university lecturer in classical archaeology at Cambridge, England, 1880-2. He was appointed director of the Fitzwilliam Museum there 1883-9, a fellow of King's College, Cambridge, 1893, and has been Slade professor of fine arts at same college since 1895. As director of the American School of Classical Studies at Athens (1889-95) and professor (1895-7), he directed excavations with signal success at Platæa, Eretria, etc. He has written: 'Excavations at the Heraion of Aegæa'; 'Balance of Emotions and Intellect' (1878); 'Essays on the Art of Phidias' (1885); 'The Work of John Ruskin' (1894); 'The Study of Art in Universities' (1895); 'The Surface of Things' (1899); 'The Jewish Question' (1899); 'The Expansion of Western Ideals and the World's Peace' (1899); 'The Argive Heraeum' (1902).

Wales wālz, Prince of, title given to the eldest son of the English sovereign since the time of Edward I. In 1902 the Prince of Wales was George Frederick Ernest Albert: b. Marlborough House 3 June 1865. He entered the navy 5 June 1877, spent two years on the training ship Britannia, and then accompanied by his brother, the late Duke of Clarence, started on a three years' voyage around the world on board the *Bacchante*. In 1883 he was made a midshipman on the *Canada*, stationed off the North American coast, and in 1885 was promoted lieutenant. He was made commander in 1890 and opened the Jamaica Industrial Exhibition. In 1891 he visited Ireland with the Duke of Clarence, and, on the latter's death in 1892, became heir to the throne and took his seat in the House of Lords as Duke of York. He was married to the Princess Victoria Mary of Teck, at Saint James' Palace, 6 July 1893, the ceremony being attended by the King and Queen of Denmark, the Czarewitch, and other royal and imperial guests. In 1901 he was appointed rear-admiral, and colonel-in-chief of the Royal Marine Forces. On 22 Jan. 1901, by the death of Queen Victoria, he succeeded his father as Duke of Cornwall, and with the duchess made a tour of the colonies, opening the first Parliament of the Commonwealth of Australia, and returning in November.

Wales, Great Britain, a former Celtic kingdom, in the central western peninsula, now an administrative division of England, and a principality, which gives the title of Prince of Wales to the heir-apparent of the British crown. It has an area of 7,466 square miles, divided into 12 counties. For the names, areas, and populations of the counties see the article ENGLAND; and for statistical matter see GREAT BRITAIN.

Wales is composed of a peninsula, with the island of Anglesey at its northwest extremity, joined at the Menai Strait by two remarkable bridges; a number of smaller islands lie chiefly at a short distance from the southwest coast. The peninsula, washed north and west by the Irish Sea, and south by Bristol Channel, and bounded west by the four English counties, Cheshire, Shropshire, Hereford, and Monmouth, is 135 miles long; where widest 95 miles, and where narrowest only 35 miles broad. It is very mountainous, particularly in the north division, where Snowdon, the culminating point of South Britain, rises to the height of 3,571 feet; is intersected by beautiful valleys, traversed by numerous streams, including among others the Severn, which has its source within it; and is rich in minerals, particularly copper in the north, and coal and iron partially there also, but much more extensively in the south. The Silurian formation, so called after the Silures, the ancient inhabitants of the principality, covers more than two thirds of the whole surface, extending continuously from the mouth of the Conway to the vicinity of Saint David's Head; but is succeeded in the south by the Old Red Sandstone, above which lies the mountain-limestone and the large and valuable coal-field. Besides the Severn, the principal rivers are the Dee, which has part of its lower course in Cheshire; the Clwyd, in Denbigh and Flint; the Conway, forming the boundary between Denbigh and Carnarvon; the Dovey, and the united Rheidol and Ystwith, which have their mouths near the centre of Cardigan Bay; the Teify, separating Cardigan on the north from Carmarthen and

Pembroke on the south; the Cleddy and Cledwen, remarkable chiefly from contributing, by their junction, to form the splendid estuary of Milford Haven, the Towy and Bury, which both fall into Carmarthen Bay; the Ebwy and Taf, which have a common estuary in Bristol Channel, the Romney, which forms part of the boundary between Wales and England, and the Usk and Wye, which, though rising in the principality, have only the earlier part of their course within it. The lakes are numerous, but the largest, that of Bala, is only four miles long and scarcely one mile broad. The climate is on the whole moderate and equable, though somewhat keen in the loftier districts. In all the counties, but more especially in the maritime, humidity is in excess, the average fall of rain in the principality being 34 inches, while that in England is only 22. Both climate and surface render Wales more adapted for pasture than agriculture. The soil, too, seldom possesses great natural fertility, except in some of the vales, of which those of the Clwyd in the north, and of Glamorgan in the south, are celebrated for productiveness. The latter, rather a plain than a vale, is of great extent, and grows excellent wheat. The system of agriculture, however, notwithstanding recent improvements, continues on the whole indifferent. The minerals, as already observed, are very valuable, and the south contains some of the largest coal and iron works in the kingdom, as well as the copper works of Swansea, probably the most extensive in the world. Of manufactures, properly so called, by far the most important are woollens. The principal articles are flannel, for which the principality has long been famous, cloth chiefly of a coarser description, and hosiery. The inhabitants are almost purely Celtic in race, being the descendants of the early Britons, who were able to maintain themselves here when the rest of the country was overrun by the Germanic invaders. One of the most striking native features is the female dress, consisting generally of a plain or checked gown, a mantle, a napkin of gay colors around the neck and shoulders, and a black beaver hat, broad-brimmed and tapering to the form of a truncated cone. All classes are distinguished by civility and hospitality. Many curious superstitions, handed down by immemorial custom, still retain their hold. The Welsh cherish their Brythonic or Cymric language with great affection. They have transplanted it to America, where it prevails in some districts, and is represented by newspapers. In 1891 there were in Wales 508,000 people who knew no English, or at least habitually spoke Welsh. Most of the upper class belong to the Established Church, but the majority are Nonconformists, the most numerous bodies being the Congregationalists, the Calvinistic Methodists, and the Baptists. See CELTS; CYMRI, CELTIC LANGUAGES, GREAT BRITAIN. WALES; COMMERCE; INDUSTRIES; AGRICULTURE; MINING; ETC.

History—Previous to the Roman occupation Wales appears to have been chiefly inhabited by three British tribes, called the Silures, Demetæ, and Ordovices. During the later period of the Roman occupation, perhaps from the reign of Diocletian, the subject part of the island was divided into four provinces, of which one, including the country from the Dee to the Severn, was called Britannia Secunda. It was after the invasion of the Saxons that the country

acquired a distinctive national character, as the refuge of the vanquished Britons who were gradually driven to the west, and many of whom migrated to Brittany (q.v.), France, whence the name, and similarity of the Breton language to the Welsh. From this period till the final conquest of the country by Edward I. there is little but a succession of petty wars between the rival chiefs or kungs into which both countries during a great part of the Saxon period were divided, or the more systematic efforts of the larger monarchy to absorb the smaller. Among the greatest of the Welsh heroes of the early period was Cadwallon. After being defeated by Edwin of Deira, or Northumbria, and compelled to flee to Ireland, he returned and defeated the Saxons in numerous battles, but was at last defeated and slain by Oswald of Northumbria in 635. While the border territories continued to be contested in incessant warfare between the two races, Offa of Mercia built the celebrated dyke (see OFFA'S DYKE) known by his name to guard the marches which he had conquered. In the middle of the 9th century Roderick, or Rhodi Mawr, succeeded in uniting the whole of Wales into one principality, but he divided it among his sons into three principalities, called respectively Gwynedd (or North Wales), Ceredigion and Dyfed (or South Wales), and Powys (composed of parts of the counties of Montgomery, Salop, and Radnor). Soon after this the Danes began to invade Wales. The country was again re-united in the 10th century under Howel, surnamed Da, the Good; but as the English monarchy also acquired unity it gradually prevailed over the smaller principality, and Athelstane received tribute as the sovereign of Wales, although his sway in the country was only nominal. The claim of the conqueror being resisted, William invaded the country and compelled the Welsh princes to do homage, but they continued in virtual independence, and became troublesome to the succeeding Norman monarchs by allying themselves with their disaffected subjects. William and his successors tried to break their spirit by granting fiefs in Wales to Normans and English on condition of conquest, and Henry I. introduced into the country a colony of Flemings. Henry I., Henry II., John, and Henry III., all made with various success a series of efforts to reduce the Welsh princes to submission. Llewellyn and David, princes of North Wales, successively did homage for that dominion to Henry III. On the death of David, Llewellyn revolted against Edward I., but was defeated by Henry, and in a subsequent revolt was again defeated and slain by the Earl of Mortimer, 1284. His brother David, who followed his example, was taken and executed. Edward I. created his eldest son Prince of Wales, and from this time Wales was united with England.

Consult: Arnold, 'Studies of Celtic Literature' (1867); Borrow, 'Wild Wales: its People, Language, and Scenery' (1901); Bund, 'The Celtic Church of Wales' (1901); Edwards, 'Wales' (1901); Rhys and Jones, 'The Welsh People' (1900); Stephens, 'Literature of the Kymry' (1876); Watt, 'Sketch of Welsh Literature' (1863).

Wales, University of (in Welsh, *Prifysgol Cymru*), a British institution established by charter in 1893, and formed by the union of association of three existing colleges, the Uni-

versity College of Wales, Aberystwith, founded in 1872; the University College of North Wales, Bangor, founded in 1884; and the University College of South Wales and Monmouthshire, Cardiff, founded in 1883. Each of the colleges has a women's hall of residence, that of the last being known as Aberdare Hall. There are no special university buildings apart from those of the colleges, but there are temporary offices at Newport, Monmouth. The university has power to grant degrees in arts or literature, science, law, theology, and music; but the constituent colleges do not supply a full course of instruction in each of these subjects, the necessary courses for the degrees of B.A. and B.Sc. being at present those chiefly provided. As regards theology, instruction is furnished by a number of theological colleges in the principality, at which students may qualify for the degree of B.D. The classes are open to persons of either sex above the age of 16 years. The first matriculation examination of the university was held in 1895.

Walfish, wôl'fish, or **Walviesch Bay**, West Africa, a harbor and small territory belonging to Great Britain since 1878, on the coast of German Southwest Africa, close to the parallel of 23° south. The harbor, frequented by whale fishers, is a good one, and is formed by a sandy spit of land which projects northward parallel with the coast, and ends in a point known as Pelican Point. It receives the river Khuisab at its head, and just beyond the northern frontier of the territory is the mouth of the river Swakop, where the German authorities have constructed a new harbor, known as Swakopmund. The enclave is included in Cape Colony for administrative purposes. The area is 430 square miles, and the population 768, of whom only 31 are white.

Walford, wâl'fôrd, Lucy Bethia Colquhoun, English novelist: b. Portobello, Scotland, 17 April 1845. She was married to A. S. Walford of Cranbrooke Hall, Essex, in 1869. Her first novel, 'Mr. Smith,' appeared in 1874, and in certain respects it has not been surpassed by any of her later works, although she has gained in ease of dialogue and description. A sound ethical purpose underlies all her many novels, among the best of which are 'Cousins' (1879); 'Troublesome Daughters' (1880); 'The Baby's Grandmother' (1885); 'The Archdeacon' (1899); 'Sir Patrick, the Puddock' (1900).

Walhalla, vâl'hâl'lâ, **Valhal**, or **Valhalla**, the great hall of the Scandinavian gods, the warriors' heaven of the Vikings. Here the heroes slain in battle feasted with Odin, drinking mead from the udder of the goat, Heidrun, and eating the flesh of the boar, Sæhrimnir, which was cooked every day, and became whole again after each daily banquet. The hall was lighted by gleaming swords, roofed with shields, and the seats covered with coats of mail. Apart from feasting, fighting their battles over again was the favorite pastime of the heroes admitted to Walhalla. See SCANDINAVIAN MYTHOLOGY.

Walke, wâk, Henry, American naval officer: b. near Portsmouth, Va., 24 Dec. 1808; d. Brooklyn, N. Y., 8 March 1896. He was appointed midshipman in the navy in 1827, was promoted lieutenant in 1839, and in the Mexican

War was executive officer on the *Vestruis*, engaged at the capture of Vera Cruz. He was promoted commander in 1855 and in 1861 was assigned to duty with the Mississippi flotilla, receiving rank as captain in 1862. He commanded the squad of gunboats which assisted Grant at Belmont; was engaged at the battles of Forts Henry and Donelson, Island No. 10, and Fort Pillow; successfully passed the Vicksburg batteries; and in 1863 was transferred to the command of the *Sacramento* and sent in pursuit of the *Alabama*. He was promoted commodore in 1866, rear-admiral in 1870, and in 1871 was at his own request placed on the retired list.

Walker, wâ'ker, Amasa, American political economist: b. Woodstock, Conn., 4 May 1799; d. North Brookfield, Mass., 29 Oct. 1875. A prominent merchant of Boston from 1825 to 1840, he was known also as an abolitionist in 1843, and 1849 visited London and Paris respectively to attend the international peace conventions of those years, and in 1848 took a leading part in the formation of the Free-Soil party. In 1848 he was a representative in the State legislature, in 1849 State senator, in 1851-2 secretary of State, having been elected by the united Free-Soil and Democratic vote. He was a member of the House of Representatives in 1862-3, to complete the unexpired term of Goldsmith F. Bailey. From 1842 to 1849 he was professor of political economy in Oberlin College; and he published: 'The Nature and Uses of Money and Mixed Currency' (1857), and 'The Science of Wealth: A Manual of Political Economy' (1866; 7th ed. 1874).

Walker, Am., American naval officer: b. Portsmouth, N. H., 13 Nov. 1845. He was graduated from the United States Naval Academy in 1866, received promotion to lieutenant in 1870, and to commander in 1894. He was on duty at the Naval Academy in 1873-6, 1879-83, 1886-90, and in 1893-7. In the last named year he was placed in command of the *Concord*, and in 1898 was engaged with her in the battle of Manila Bay. He received rank as captain in 1899 and was assigned to duty at the Naval War College, Newport, R. I. He was a member of the naval examining board at Washington in 1900-1 and since 1903 has been in command of the *San Francisco*.

Walker, Francis Amasa, American economist and soldier: b. Boston 2 July 1840; d. there 5 Jan. 1897. He was the son of Amasa Walker (q.v.), was graduated at Amherst in 1860, began the study of law, which he gave up to enlist in the Union army, and served through nearly the whole of the Civil War. His rank during the greater part of the War was that of lieutenant-colonel, and in 1865 he was brevetted brigadier-general of volunteers. He taught Greek and Latin at Williston Seminary, Easthampton, Mass., from 1865 to 1868, and in the latter year was connected with the staff of the *Springfield Republican*. After serving as head of the Bureau of Statistics of the Treasury Department, in 1870 he was made superintendent of the 19th census, and in 1872 became commissioner of Indian affairs. From 1873 to 1881 he was professor of political economy and history in the Sheffield Scientific School at Yale, and in 1877-9 was lecturer at Johns Hopkins University. He was the representative of the United

States at the International Monetary Conference, Paris, in 1878. In 1880 he was appointed superintendent of the 10th census. Accepting the presidency of the Massachusetts Institute of Technology in 1881, he continued in that position till his death. He was president of the American Statistical Association from 1882 to 1897, and of the American Economic Association in 1885-92. He was an earnest advocate of international bimetalism, was deeply interested in all economic questions, particularly those concerning wages and profits, upon which he wrote with effective clearness and force. His work has exerted a marked influence upon economic study. His writings include: 'The Indian Question' (1874); 'The Wages Question' (1876); 'Money' (1878); 'Money in Its Relation to Trade and Industry' (1879); 'Political Economy' (1883); 'Land and Its Rent' (1883); 'History of the Second Army Corps' (1886); 'Life of General Hancock' (1894); 'The Making of the Nation' (1895); and 'International Bimetalism' (1896). Consult 'Publications of the American Statistical Association,' Vol. V. (1896-7), for bibliography and biographical notices.

Walker, Frederick, English painter: b. London 26 May 1840; d. Saint Fillans, Perthshire, 4 June 1875. After an ordinary school education he worked for a time in an architect's office, and then pursued his art studies at the British Museum, in an Art Academy, and in the Royal Academy schools. He became an apprentice to Whymper, the wood engraver, in 1858, and soon afterward began to provide drawings for 'Good Words,' the 'Cornhill Magazine,' and other periodicals. He illustrated the 'Adventures of Philip' and the 'Denis Duval' of Thackeray. He exhibited his first oil picture, 'The Lost Path,' at the Academy in 1863. He was elected an associate of the Old Water-color Society in 1864, and in 1871 he became an associate of the Royal Academy. His principal pictures in oils were: 'Wayfarers' (1866); by some considered his best oil-painting; 'Bathers' (1867); 'Vagrants' (1868), in the National Gallery; 'The Old Gate' (1869); 'The Plough' (1870); 'At the Bar' (1871); 'The Harbour of Refuge' (1872), in the National Gallery; and 'The Right of Way' (1875). Among his more numerous works in water-color the following may be mentioned: 'Philip in Church' (1863); 'The Young Patient'; 'The Shower'; 'The Village School'; 'Jane Eyre'; 'Refreshment'; 'Spring'; 'Autumn' (1865); 'The Bouquet' (1866); 'The Gondola'; 'In a Perthshire Garden'; 'The Housewife'; 'The Rainbow'; and 'The Fishmonger's Shop.' Consult Marks, 'Life and Letters of Frederick Walker' (1896).

Walker, George, Irish Anglican clergyman: b. of English parents in County Tyrone 1618; d. Boyne 1 July 1690. He was educated at Glasgow University, took orders, and in 1674 became rector of Donaghmore, near Dungannon. In April 1689 was made joint governor of the besieged town of Londonderry after the traitorous governor, Lundy, had been allowed to escape, and did much to inspire the heroic defenders in the siege of 105 days. He received the thanks of the House of Commons, and had honorary degrees conferred upon him by Cambridge and Oxford. He fell at the battle of the Boyne, being at the time of his

death bishop-designate of Derry. His 'True Account of the Siege of Londonderry' (1689) and 'Vindication' of it are reprinted in Dwyer's 'Siege of Londonderry' (1893).

Walker, Hugh, Scottish author: b. 7 Jan. 1855. He was educated at the universities of Glasgow and Oxford, and is professor of English literature at Saint David's College, Lampeter, South Wales. He is the author of 'Three Centuries of Scottish Literature' (1893); 'Greater Victorian Poets' (1895); 'The Age of Tennyson' (1897).

Walker, James, American college president and Unitarian clergyman: b. Burlington, Mass., 16 Aug. 1794; d. Cambridge, Mass., 23 Dec. 1874. He was graduated from Harvard in 1814, studied for the ministry, and was pastor of the Unitarian Church, Charlestown, Mass., 1818-39. He was professor of moral and intellectual philosophy at Harvard 1839-53, and president of Harvard University 1853-60. From 1831 to 1839 he edited the 'Christian Examiner.' He edited the works of Dugald Stewart, and Thomas Reid, published a 'Memoir of Josiah Quincy' (1867), and delivered lectures on 'Natural Religion' and 'The Philosophy of Religion.' He was famous as a pulpit orator.

Walker, James, American artist: b. England 3 June 1819; d. Watsonville, Cal., September 1889. He emigrated to the United States and settled in New York city early in life. In 1884 he went to San Francisco to paint a picture for a private gallery. It was a French battle-piece, and his success was so complete that he became widely known as a painter of military pictures. His principal works include: 'The Battle of Lookout Mountain'; 'The Battle of Chapultepec'; and 'The Repulse of Longstreet at Gettysburg.'

Walker, John, English actor and lexicographer: b. Colney Hatch, Middlesex, 18 March 1732; d. London 1 Aug. 1807. He was for a time engaged by Garrick at Drury Lane, was a leading member of the company at Crow Street Theatre, Dublin, 1758-62, and was at Covent Garden 1762-7. In 1768 he left the stage, and, after conducting a school at Kensington for two years, became a lecturer on elocution. His published works include, among others: 'A Dictionary of the English Language, answering at once to the Purposes of Rhyming, Spelling, and Pronouncing' (1775; latest ed., 1888); 'Elements of Elocution' (1781); 'A Rhetorical Grammar' (1785); 'The Melody of Speaking Delineated' (1789); 'A Critical Pronouncing Dictionary and Expositor of the English Language' (1791), his chief work, which was long regarded as a standard for pronunciation.

Walker, John Grimes, American rear admiral: b. Hillsboro, N. H., 20 March 1835; d. York Beach, Me., 16 Sept. 1907. He was graduated from the Naval Academy in 1856, and during the Civil War was employed in the blockading service and in the Mississippi squadron, becoming lieutenant-commander in 1862; in 1866 he was promoted to the rank of commander for gallantry. He was chief of the bureau of navigation 1881-8, became commodore in 1889, and commanded the squadron of evolution 1889-93. In 1894 he was appointed to protect American interests in the

Hawaiian Islands, was commissioned rear admiral the same year, and retired in 1897. From 1899 he was president of the Isthmian Canal Commission.

Walker, Robert James, American financier and political leader: b. Northumberland, Pa., 29 July 1801; d. Washington, D. C., 11 Nov. 1869. He was graduated from the University of Pennsylvania in 1819, studied law, and was admitted to the bar in 1821. He commenced the practice of law at Pittsburg, Pa., where in 1823 he attracted attention as the first to suggest Jackson as a candidate for the Presidency. In 1826 he moved to Natchez, Miss., where he soon acquired an extensive law practice; he also became influential in political life, was active in opposing the Nullification movement in 1832-3, and in obtaining the passage of an act by the State legislature denouncing the South Carolina Nullification Act as treasonable. In 1836 he was elected to the United States Senate as a Democrat, where he introduced the first Homestead Bill, supported the policy of Van Buren in regard to the separation of the government from the banks; and persistently advocated gradual emancipation, having freed his own slaves in 1838. He also introduced the resolution recognizing the independence of Texas, and having obtained a strong influence over President Tyler, induced him to take the steps which resulted in the annexation of Texas. He was active at the Democratic national convention of 1844 in obtaining the nomination of Polk; and during the campaign of that year wrote a letter in favor of the annexation of Texas which had a widespread influence. In 1845 he was appointed secretary of the treasury, conducting the affairs of his office with marked ability; in this position he framed the tariff bill of 1846, and was instrumental in establishing the warehouse system, an independent treasury, and in organizing the Department of the Interior. At the close of his term of office in 1849, he engaged in the practice of law in Washington; in 1857 was appointed governor of the Territory of Kansas, but resigned in 1858, being unwilling to aid in forcing slavery upon the Territory. During the Civil War he warmly supported the Union, was sent abroad as financial agent for the United States in 1863, and succeeded in negotiating a loan, and in preventing the sale of an issue of Confederate bonds. After the war he devoted himself to his growing law practice, but continued to hold a position of influence in public affairs, advocating the purchase of Alaska and opposing the impeachment of President Johnson.

Walker, Sears Cook, American mathematician and astronomer: b. Wilmington, Middlesex County, Mass., 28 March 1805; d. Cincinnati, Ohio, 30 Jan. 1853. He was graduated at Harvard College in 1824, taught school near Boston for two years, and in 1827 removed to Philadelphia, where also he engaged in teaching. His parallax tables, first prepared in 1834, for the latitude of Philadelphia, reduced the time needed for computing the phases of an occultation to less than half an hour. In 1837 he was invited to prepare a plan for the organization of an observatory in connection with the Philadelphia High School, and from its equipment in 1840 until 1852 he published in the 'Proceedings of

the American Philosophical Society' and the 'American Journal of Science' frequent and copious observations and investigations which he had made. In 1841 he published a valuable memoir on the periodical meteors of August and November. In 1845 he took part in the Washington naval observatory, where on 2 Feb. 1847, four months after the detection of the planet Neptune, he made the discovery that a star observed by Lalande in May 1795 must in fact have been this planet. By subsequent alternating computations of Pierce and Walker, the former investigating the perturbations, and the latter the orbit, the theory of Neptune was at once placed on a footing comparable with that of the other large planets. In 1847 he was invited to take charge of the longitude computations of the United States coast survey, an office in which he continued until his last illness. By the joint labors of Walker and Bache the method of telegraphic longitude determinations was developed and successfully carried out as early as 1849, with greater precision than was attained in Europe ten years later. The introduction of the chronographic method of recording observations belongs to Walker and Bache. The prosecution of the telegraphic method of longitude soon led Walker to the discovery that the time required for the transmission of the galvanic signal was measurable, and the velocity by no means as high as had been supposed.

Walker, William, American adventurer: b. Nashville, Tenn., 8 May 1824; d. Trujillo, Honduras, 12 Sept. 1860. After study of law and medicine, he was a journalist in New Orleans and San Francisco, and practised law in Marysville, Cal. In 1853 he organized a filibustering expedition against Lower California and the Mexican state of Sonora. On 4 November he arrived at La Paz, made the Mexican governor a prisoner, and proclaimed a new régime to the inhabitants of Lower California. In a few weeks difficulties arose. Reinforcements did not appear, desertions greatly reduced his force, and he was obliged to retreat across the border into California and surrender himself and band to a detachment of United States regulars. He was tried (May 1854) at San Francisco, for violation of the neutrality laws, and acquitted. But Walker was soon planning new conquests. Taking advantage of insurrectionary troubles in Nicaragua, and to some extent abetted by American capitalists interested there, he landed at Realejo 11 June 1855; and, having with his followers and a few natives won some trifling battles, managed to accomplish a peace which recognized Rivas, leader of the party favored by Walker, as president, and Walker himself as generalissimo. Many Southerners joined him as recruits, and on 1 March 1856 he had, it is said, 1,200 troops. The Pierce administration proclaimed the neutrality laws, and made attempts at prosecution, but expeditions sailed with comparative freedom from San Francisco and New Orleans to Walker's aid. Finally Vijil, a priest, the diplomatic representative of what was really the Walker government, was received 14 May 1856, though the North and many conservative Southerners condemned the action. The envoy did not remain long at Washington. Rivas absconded, and in June Walker got himself elected to the presidency. In September he published a decree repealing all laws against

WALKER—WALL-CREEPER

slavery, which had not existed in Nicaragua for 32 years. Undoubtedly he believed that such a procedure would obtain for him valuable support in the slave States. But the United States government declined to recognize him or his ministers, and his arbitrary acts provoked a native insurrection. At last he was held between Lake Nicaragua and the Pacific by an allied army of native Nicaraguans and Costa Ricans, and on 1 May 1857 he gave himself up to Commander C. H. Davis of the United States sloop-of-war *Saint Mary's*, under a treaty of capitulation obtained from Costa Rica. He was taken to New Orleans, and quickly began plotting to organize a new expedition. Arrested for violation of the neutrality laws, he was released on bail, which he forfeited, going with about 200 followers, arms, and supplies to Greytown, where he arrived 25 November. In early December Commodore Paulding, United States Navy, of the *Wabash*, compelled him to surrender. Walker presented himself as a prisoner of state at Washington in January 1858, but President Pierce declined to hold him as a prisoner, on the ground of his illegal apprehension on foreign soil. A. H. Stephens wrote in 1858 that the reason for the opposition to Walker was that "if successful, he would introduce African slavery there" [Nicaragua]. Walker was received with more or less of an ovation in the Gulf States. In October 1858 he sailed again from Mobile, but was arrested at the mouth of the Mississippi, tried at New Orleans, and acquitted. In June 1860, with a small force, he went to Trujillo to stir up revolution in Honduras. His followers were reshipped to the United States, while he was condemned and shot. He published 'The War in Nicaragua' (1860), in justification of his acts. Consult: Joaquin Miller's poem 'Walker in Nicaragua'; Doubleday, 'Reminiscences' (1886); Roche, 'Story of the Filibusters' (1891).

Walker, William Sidney, English Shakespearean scholar: b. Pembroke, Wales, 4 Dec. 1795; d. 15 Oct. 1846. He was educated at Trinity College, Cambridge, becoming a fellow of his college in 1820. Unorthodox views regarding eternal punishment prevented him from taking orders, and accordingly he had to resign his fellowship in 1829. His friend Moultrie edited in 1852 a collection of his 'Poetical Remains,' and W. N. Lettsom compiled from his papers the works entitled 'Shakespeare's Versification, and its Apparent Irregularities explained by Examples from Early and Late English Writers' (1854); and 'A Critical Examination of the Text of Shakespeare, with Remarks on his Language and that of his Contemporaries, together with Notes on his Plays and Poems' (1860), which are of the utmost value to students of Shakespeare and Elizabethan literature.

Walker, Williston, American church historian: b. Portland, Maine, 1 July 1860. He was graduated from Amherst College in 1883 and from Hartford Theological Seminary in 1886. He was professor of church history at the latter institution 1889-1901, and since 1901 has held a similar post at Yale University. He has published 'The Creeds and Platforms of Congregationalism' (1893); 'A History of the Congregational Churches in the United States' (1894); 'The Reformation' (1900); 'Ten New England Leaders' (1901).

Walker's Battery, in electricity, a battery in which the electro-negative plate is gas graphite or platinized graphite. It is excited by dilute sulphuric acid. See **BATTERY**.

Walkerton, wá'kér-tŏn, Canada, capital of Bruce County, Ontario, 65 miles northwest of Guelph, on the Saugeen River, and on the Walkington, Grey & Bruce railroad. It is a thriving and growing town, with extensive water power, several mills, iron foundry, and other industrial establishments.

Walkerville, wá'kér-víl, Canada, a town of Essex County, Ontario, on the Detroit River, two miles northeast of Windsor, near the outlet of Lake Saint Clair. It has ship-building yards, a distillery, and other industrial establishments. Pop. about 2,000.

Walkill River. See **WALKILL**.

Walking Delegate, an official connected with a trade union, whose duty it is to visit the various places at which members of his craft are employed, and personally ascertain that no laws of that particular trade guild are infringed by the workmen; also, in cases where an unexpected strike has been ordered by the executive board, it devolves on him to notify men connected with the union to cease work. See **UNIONISM**.

Walking-fish. See **SERPENT-HEAD**.

Walking-leaf. See *Pilicolas* (6), under **FERNS AND FERN ALLIES**; **LEAF-INSECT**.

Walking Purchase, Tho. In 1682 William Penn (q.v.) purchased of the Delaware Indians, a tract of land in the present counties of Bucks and Northampton, Pa., bounded on the east by the Delaware River, and in the interior at a point as far as a man could walk in three days. Penn and a party of Indians started on the walk, beginning at the mouth of Neshaminy Creek. At the end of a walk of a day and a half Penn concluded that it was as much land as he wanted and a deed was given to the lands at that point—about 40 miles from the starting place. In 1737 after Penn's death the tract was increased by a party of expert walkers to a point 70 miles in the interior instead of 40 miles. See **DELAWARE INDIANS**; **PENN, WILLIAM**.

Walking Stick, or **Stick-insect**, a wingless orthopterous insect of the family *Phasmida*, so called because in its slender, elongated form and greenish-gray hue, it resembles a dry twig so closely as easily to be mistaken for one when not moving. This is doubtless of great service to these insects as a protection against birds and other enemies which easily overlook them. Some species are several inches long. They are near relatives of the mantids, and are natives of sub-tropical and the warmer temperate regions, and walk gently among the branches of trees, reposing in the sun, with their long antennae-like legs stretched out in front. They feed upon the green parts of plants, but are rarely numerous enough to do much damage. Consult Howard, 'The Insect Book' (New York 1901). See **ARALIA**.

Wall-creeper, a small bird (*Tichodroma muraria*) of the European Alps, which frequents walls and perpendicular rocks in preference to trees, on whose rough trunks its relatives, the creepers (*Certhia*) make their living. It is

WALL DECORATION—WALL PAPER

about six inches long; plumage light gray, with bright crimson on the shoulders, the larger wing coverts, and the inner webs of the secondaries, the rest of the wings black; tail black, tipped with white. Called also spider-catcher.

Wall Decoration. See MURAL DECORATION.

Wall-eyed Pike, or Glass-eye, one of the pike-perch (*Stizostedion vitreum*) of the central part of the United States, so called in reference to its large staring eyes, also absurdly called salmon or jack-salmon in some parts of the South. Its body is elongate, back arched, head subconic, long; cheeks, gill-covers and top of head more scaly; dorsal spines high; dark olive, mottled with brassy; sides of head vermiculated; first dorsal fin with a large black patch on the hinder margin. Length one to three feet. It reaches its greatest development and abundance in the Great Lakes region and upper Mississippi, but is also found southward, eastward and northward to Georgia, Pennsylvania and Assiniboia, respectively. In lakes it inhabits the deep holes or areas where the bottom has been scoured by inflowing streams. In rivers it loves to hide under logs and rocks in the deep holes beneath dams and falls and amid swiftly flowing waters. It is a predaceous fish and devours all smaller species. The wall-eyed pike is a prolific spawner and great numbers of the fish congregate on shallow, well-cleaned bottoms for this purpose. Because of the fine quality of its flesh and the large size (10 to 30 pounds) which it attains, this fish is highly valued, and in the Great Lakes region ranks next to the white-fish in commercial importance. The smaller sand-pike or sauger (*S. canadense*) has a similar but less extended distribution and similar habits. Consult Jordan and Evermann, 'American Food and Game Fishes' (New York 1902).

Wall-flower, a cruciferous herb (*Cheiranthus cheiri*) of southern Europe, where it blooms on rocky cliffs and walls. The plant itself is not handsome, having crowded, twisted, lanceolate leaves, but is cultivated for the sake of its flowers, which are large and in short, head-like, terminal racemes. The petals are four-clawed and spreading, have a velvety surface, and range in color through all shades of yellow and orange to a rich mahogany-brown. They are frequently variegated with these hues, and might be the "streaked gilly-flowers, which some call nature's bastards," scorned by Perdita, of the 'Winter's Tale.' One of their common names, moreover, is gilly-flowers or wall-gilly-flowers. Wall-flowers are biennials, blooming from early spring until autumn, and are offered for sale in French and English cities during the winter. They have a strong and delicious odor of violets.

The native wall-flower of Australia is a leguminous plant (*Pultenea daphnoides*). In the United States, a cruciferous plant of dry plains, with orange-yellow large flowers, is known as the western wall-flower (*Erysimum asperum*).

Wall Paintings. See MURAL DECORATION.

Wall Paper, or Paper Hangings, called by the French *papier peint*, ornamental colored paper affixed to the walls of houses as a substitute for the ancient tapestry hangings. The Chinese appear to have employed paper for this use from time immemorial, and the English claim to have

first introduced the practice into Europe. On the other hand, the French assert that printed paper hangings were first made at Rouen as early as 1620 or 1630 by one François, and that the art was perfected in the latter part of the 18th century by Reveillon in Paris. It has certainly prospered more in France than in any other country; and so much taste and skill have there been developed in the manufacture, that the French papers have been sought for in preference to all others. In Paris are numerous factories of paper hangings, employing more than 3,000 workmen, in Lyons are three establishments, and one each at Mulhouse, Strasburg, and Metz. Others are found in Belgium, Germany, Holland, England, and Russia. In the United States the first wall paper factory was established in 1790 by John B. Howell at Albany, N. Y. Paper was at that time made only in sheets, and had to be joined before being printed. Color was then applied by means of a brush to form the background of the design, and the latter was subsequently printed upon the paper from wooden blocks, as many blocks being used as there were colors in the pattern, each block having a part of the pattern upon it in one color. One block was printed the whole length of the paper before the next color was applied. It should be stated that this method of printing by means of blocks still prevails, but only in connection with designs which, on account of their dimensions, or through some other peculiarity, cannot be printed on the cylinder-machines that have practically supplanted block or hand work, as it is termed. The method of applying color to the background by means of a hand-brush has, however, been done away with altogether. It does not appear that any other factories were established until about the year 1810, at which time a man named Boriken was engaged in the business. The Howell firm had meanwhile sold out their Albany business to Lemuel Steel, and, after a short experience in New York and Baltimore, had finally, in the year 1820, located at Philadelphia, Pa., where they have been established ever since, the present owners comprising the third and fourth generations engaged in the business. It was not, however, until 1844 that any decided advance was made in the growth of the industry. About that time paper in continuous lengths came into more general use, and the necessity of joining sheets together was obviated. In that year, also, the first machine for printing wall paper was imported from England and introduced into the Howell factory. While very crude, as it printed only a single color, it had a stimulating effect on the business, inasmuch as it enabled goods to be produced at a largely reduced price, and increased the volume of the business considerably. As near as can be ascertained, the entire production of wall paper in the United States at that time did not exceed \$250,000. The second printing apparatus was imported from England in 1846, this one printing six colors. Machines were subsequently built in this country, at first by the machinists connected with wall paper factories, but after a time a specialty of this class of work was made by William Waldron of New Brunswick, N. J. The printing-machine of to-day is unquestionably a great improvement on that originally imported into this country, although the prin-

WALL OF SEVERUS—WALLA WALLA

ple of its operation is practically the same. It is cylindrical in shape. The paper passes over the cylinder, the pattern being printed on it by means of rollers on which the design has been placed, each roller representing one of the colors used in the design. These rollers are registered so accurately that as the paper, in passing over the revolving cylinder, reaches one of them, it leaves the impression on the paper, and the succeeding rollers follow in regular order. The paper is hung up by an automatic process as it leaves the machine, and passes into drying-racks which are usually several hundred feet in length, after which it is rolled up in lengths of 8 to 16 yards, and is ready for market.

While the printing-machine is necessarily the most prominent feature of the business, yet other factors have contributed largely to the progress made by this industry. Among them are the grounding-machines, which furnish the background color to the paper; the bronzing-machines, which apply bronze powders to certain of the goods; the embossing-machines, which give various textures to the goods after they have been printed; the pressing-machines, which are used to make goods showing the design in relief; the machine or contrivance that is used to hang up the paper after it leaves the printing-machine; and a host of similar devices that enable the manufacturer to produce novel effects and manufacture the goods more rapidly than before, and at a lessened expense. It is these contrivances that have led to the tremendous progress achieved by this industry in the last 60 years, and more particularly within the last 30 years (the pace having been accelerated each year), which have enabled us to become independent of foreign manufacturers, and, notwithstanding a reduction of duties on wall paper, have caused a continued falling off in imports, so that at the present time importations of wall paper are simply nominal.

The improvements were such as were called for by the exigencies of the moment, slight at the time, but cumulative, and enabling the industry eventually to attain its present state of perfection. The most notable are as follows: (1) Soon after the introduction of the printing-machine one McKernan invented a contrivance for festooning the paper automatically as it leaves the printing-machine and passes on to the drying-racks. This was undoubtedly a long stride in the process of making wall paper, inasmuch as the speed of the printing-machine could be increased to the full capacity of the drying-racks connected with it. (2) The single (or continuous) process of making wall paper was introduced about the year 1870. Formerly the ground color had to be applied by one machine, after which the paper was dried and rolled up and next passed through the printing-machine to receive the impressions of the design thereon. In the continuous process the paper passes through the machine which applies a ground color for the design, and then passes through a drying apparatus that is termed a "hot box," or into drying-racks, and then automatically passes into the printing-machine which applies the colors of the design, saving a double handling of the goods and involving less waste. (3) The method of applying bronze powders to wall paper automatically was introduced about the year 1872, although, as it was conducted in se-

cret for some time by one or two firms, the discovery may have been made at an earlier date. This method reduced largely the cost of making bronze (otherwise termed gold) papers, and led to an increased demand and output of them. (4) The next and most recent discovery was the application to wall paper of bronze powders in a liquid state; that is, mixed with an adhesive material (made from potato-starch) of sufficient density to keep the bronze powders in solution without impairing their lustre. This was first placed upon the market about 1882, and as the new process enabled the use of as many different shades of bronze as there were colors in the design, the opportunity was afforded for producing many new and brilliant effects, and for superseding in a large measure bronze or gold goods made by the former method. While the mechanical part of the business has made vast strides, there is yet another feature that outranks it in importance, and that is the artistic element. The American people have a constant craving for something new, and the manufacturer is taxed to the full extent of his powers to satisfy this demand. On no industry does this demand fall more heavily than on wall paper manufacture, and by no occupation has the demand been more fully satisfied.

Wall of Severus. See HADRIAN'S WALL.

Wall Street "Corners". Since 1835 the famous corners in the American stock market have been as follows:

Year	Stock	Start's price	High price
1835	Morris Canal	30% below par.....	150
1835	Harlem River R.R.	123	200
1835	Harlem Railroad.....	60	164
1843	Harlem Railroad.....	112	160
1865	Prairie du Chien.....	60	250
1867	Milwaukee & St. Paul	47	111
1869	Gold	A small premium.....	160
1872	Northwestern	Around par	230
1887	Hannibal & St. Joe.....	98 (in one day).....	208
1901	Northern Pacific.....	170 (in one day).....	1,000

Wall-tiles. See TILES.

Walla Walla, wōl'a wōl'a ("rushing water"), a tribe of the Shapshapian stock of North American Indians, formerly occupying the country about the lower Walla Walla River, and along the east bank of the Columbia River from the Snake nearly to the Umatilla, in Washington and Oregon. Their language resembles that of the Nez Percés. By treaty of 1855 they were assigned to the Umatilla reservation in Oregon, where they numbered 325 in 1901. See SHAPSHAPIAN.

Walla Walla, Wash., city, county-seat of Walla Walla County, on the Walla Walla River, 28 miles east of the Columbia River, and on branch lines of the Northern Pacific and the Union Pacific R.R.'s; 150 miles southwest of Spokane. A United States fort was established near the site of the city in 1857, and around this fort grew up a trading post and settlement; it was first called Steptoeville, but when the town was incorporated in 1859 the name of Walla Walla was adopted. It was first incorporated as a city in 1862, and received a second charter in 1884. The city is situated about 15 miles west of the Blue Mountain range, at an altitude of 1,060 feet; it is surrounded by the beautiful and fertile Walla Walla Valley, over 100 miles in length, forming a part of the "Inland Empire" between the Rocky and Cascade ranges, and

consisting of a belt of agricultural land, the larger part under cultivation, which yields large crops of wheat, oats, and barley, as well as vegetables and fruits. In this valley the city of Walla Walla is the centre of trade, and it has become one of the most important commercial cities of the eastern part of the State. It contains an extensive plant for the manufacture of farm machinery and implements and other manufacturing establishments, including gas and electric power works with important improvements under way (1910), two flouring mills, and lumber mills; and has five banks, of which two are national banks. Among its notable public institutions are the United States Land Office, United States District Court, an Odd Fellows' home for the State of Washington, the Stubblefield home for indigent widows and orphans, with \$135,000 of perpetual endowment, and two hospitals. Fort Walla Walla joins the city on the west, and six miles to the west is the monument to the memory of the martyred pioneer and patriot, Marcus Whitman. Walla Walla is also of importance as an educational centre; it has a public library and an excellent system of public schools, including a large high school, and is the seat of the far-famed Whitman College and Academy, a Roman Catholic seminary for girls and an academy for boys, and the St. Paul's seminary for girls (Protestant Episcopal), while Walla Walla College is located two miles outside the city near the fort. The city has an excellent supply of pure water from mountain streams, and a first-class system of waterworks owned and operated by the municipality. The government is vested in a mayor, elected annually, and a council of seven; the city officials are mostly elected by popular vote. Pop. (1890) 4,709; (1900) 10,049; according to the 1910 census, 19,364. Consult Lyman, 'History of Walla Walla County' (1901).

HOLLOW PARKER.

Wallaby, a native name applied to various small kangaroos (q.v.), especially those called brush-kangaroos, which frequent dense scrub-jungle and have great leaping powers. One of the largest species is the red-necked (*Macropus ruficollis*), which is 40 inches or more long, with a tail 30 inches in length; it is South Australian, and is represented in Tasmania by the smaller Bennet's wallaby. Several other species occur in Australia and Borneo, one of which (*M. thediti*) is very common and known to the colonists as pademelon (q.v.).

Wallace, wŏl'ŭs, Alfred Russel, English naturalist and philosopher; b. Usk, Monmouthshire, 3 Jan. 1823. He was educated at Hertford Grammar School, and afterward articulated to a land surveyor and architect. Later when resident at Leicester as English master at the collegiate school he made the acquaintance of Henry Walter Bates, like himself an enthusiastic entomologist, and in April 1848 the two sailed from Liverpool on a journey to the Amazon Valley, which marks an epoch in scientific travel. They ascended the Tocantins in August 1848, and in the following year ascended the Amazon. In March 1850, they separated, Wallace taking the basin of the Rio Negro for his ground and Bates that of the Solimões or Upper Amazon. Wallace returned to England in 1852, and in 1853 published 'A Narrative of Travels on the Amazon and Rio Negro.' An-

other result of this journey was a small work on 'Palm-Trees of the Amazon and their Uses' (1853). Of still greater importance to the progress of modern biological geography and philosophy was his eight years' residence (1854-62) in the islands of the Malay Archipelago, because it led him to the formulation of his theory of natural selection, and produced that scientific classic, 'The Malay Archipelago, the Land of the Orang-Utan and the Bird of Paradise: a Narrative of Travel, with Studies of Man and Nature' (1869). His natural selection theory was contained in a paper 'On the Tendency of Varieties to Depart Indefinitely from the Original Type,' which he sent to Mr. Darwin in 1858, and on 1 July of that year it was read at a meeting of the Linnean Society with a statement of the practically identical theory which Darwin had been elaborating independently for many years. His work in Malaysia is fittingly commemorated by the application of his name to the imaginary line (Wallace's Line) between Bali and Lombok, which, as he showed, marked the boundary between an Asiatic and an Australian fauna in the archipelago. In 1870 he published 'Contributions to the Theory of Natural Selection,' and in 1876 issued the first thoroughly scientific treatise on zoogeography, 'The Geographical Distribution of Animals, with a Study of the Relations of Living and Extinct Faunas as elucidating the Past Changes of the Earth's Surface.' This subject was further developed in the more popular work, 'Island Life, or the Phenomena and Causes of Insular Faunas and Floras, including a Revision and attempted Solution of the Problem of Geological Climates' (1880). 'Tropical Nature and other Essays' (1878) contains suggestive papers on sexual selection, color in nature, and similar subjects, and was reissued, with modifications and additions, in one volume with 'Contributions to the Theory of Natural Selection' in 1891. In 'Darwinism: an Exposition of the Theory of Natural Selection, with some of its Applications' (1889), he gives a final and masterly statement of the theory of organic evolution as he conceives it, with abundant illustrations from his first-hand knowledge of the facts. He stands by pure Darwinism, refusing to admit the additional elements, such as sexual selection, which Darwin himself adopted in his later works. He refuses to extend evolution to the development of mind, and he adopts Weismann's views on heredity. In short, he holds by organic evolution only in so far as it is consistent with or required by a spiritual interpretation of man and nature.

Wallace's work has been by no means confined to natural history. In 1866 he issued a work on 'The Scientific Aspects of the Supernatural'; and in 1875 gave in 'Miracles and Modern Spiritualism' a full statement of his spiritualistic faith. He issued in 1885 a pamphlet entitled 'Forty-Five Years of Registration Statistics, proving Vaccination to be both Useless and Dangerous.' He gave evidence before the recent Royal Commission on the subject, and in 1898 published 'Vaccination a Delusion, its Penal Enforcement a Crime,' in which he endeavored to prove that the majority report of the commission is opposed to the best evidence laid before it. In 'Land Nationalization: its Necessity and its Aims' (1882) he compares the landlord-and-tenant system of land tenure with

WALLACE

an occupying tenancy under the state, and strongly advocates the latter. A Land Nationalization Society, of which he is president, has been formed to disseminate the principles of his book. 'Bad Times: an Essay on the Present Depression of Trade' (1885) is another contribution to economics. He prepared the volume 'Australasia' (1879) in Stanford's 'Compendium of Geography and Travel,' and to the new issue contributed the first of the two volumes on Australasia, dealing with Australia and New Zealand (1893). In 1868 he published 'The Wonderful Century, its Successes and its Failures,' a review of the 19th century; and in 1901, 'Studies, Scientific and Social.' He was awarded the Royal Medal of the Royal Society in 1868, the Gold Medal of the Société de Géographie in 1870, the Darwin Medal of the Royal Society in 1890, the Founder's Medal of the Royal Geographical Society, and the Gold Medal of the Linnean Society in 1892.

Wallace, David Duncan, American historian: b. Columbia, S. C., 23 May 1874. He was graduated at Wofford College, Spartanburg, S. C., in 1894, where he became professor of history and economics in 1899. He has published 'Constitutional History of South Carolina, 1725 to 1755' (1899), and several historical monographs.

Wallace, Sir Donald Mackenzie, English writer: b. 11 Nov. 1841. He was educated at the universities of Edinburgh, Berlin, and Heidelberg, and at the Ecole de Droit, Paris. He was private secretary to the viceroy of India in 1884-9, attended the czar's wedding during his tour in India and Ceylon in 1890-1, was director of the foreign department of the *Times* in 1891-99. He has published 'Russia' (1877); 'Egypt and the Egyptian Question' (1883); 'The Web of Empire' (1902); etc.

Wallace, John Findley, American civil engineer: b. Fall River, Mass., 10 Sept. 1852. He was educated at Monmouth College and the University of Wooster, and in 1869-70 was engaged in railway service. In 1871 he became assistant engineer of the United States Engineers, and was appointed county surveyor and city engineer in 1878. He has been engaged as chief engineer and superintendent on various railroads since 1879, and in 1891 entered the service of the Central Railroad, becoming general manager of the Illinois Central system in 1902. In 1904 he was appointed chief engineer in charge of building the Panama Canal. On 29 March 1905 he with the other members of the commission, resigned, was reappointed on 3 April, but again resigned 24 June 1905.

Wallace, Lewis (better known as "Law"), American soldier and author: b. Brookville, Franklin County, Ind., 10 April 1827; d. Crawfordsville, Ind., 15 Feb. 1905. He studied law; at the beginning of the Mexican war enlisted as second lieutenant in the 1st Indiana infantry; in 1848 began professional practice, which he carried on at Covington, Ind., and Crawfordsville, Ind., and for four years was in the State senate. At the outbreak of the Civil War he was appointed adjutant-general of Indiana and soon afterward colonel of the 11th Indiana volunteers; on 3 Sept. 1861 was made a brigadier-general of volunteers; and for ability displayed

in leading a division at Fort Donelson (q.v.) was made major-general of volunteers 21 March 1862. He participated in the second day's fight at Shiloh, and in the advance on Corinth; was president of the court of inquiry regarding Don Carlos Buell (November 1862); in 1863 prepared the Cincinnati defenses, and later was made commander of the Eighth army corps, with headquarters at Baltimore. At the battle of the Monocacy (9 July 1864) he was defeated, but detained the enemy until Wright, with reinforcements, could reach Washington before Early. In 1865 he resumed law practice; in 1878-81 was governor of New Mexico, and in 1881-5 was minister to Turkey. He published 'The Fair God' (1873); 'Ben Hur' (1880); a 'Life' of Benjamin Harrison (1888); and 'The Prince of India' (1893).

Wallace, William, American manufacturer: b. England 1825; d. Washington 20 May 1904. Early in life he came to the United States with his father and established the firm of Wallace & Sons at Ansonia, Conn., which soon became one of the leading manufactories of copper and brass alloys in the United States. Becoming associated with Moses G. Farmer (q.v.), they began the manufacture of a compound telegraph wire, consisting of a steel core and an electrotyped copper covering, thus giving conductivity and strength, combined with lightness. In 1876, at the Centennial Exhibition, he brought out the Farmer-Wallace dynamo machine, with which the buildings were successfully lighted, being the earliest general electric lighting in this country. A year or two later he devised a plate arc lamp for use with this machine, by means of which a number of arc lights could be placed in series on the circuit, thus originating the series method of arc lighting. For several years before his death he was engaged in scientific investigation, especially in work with the microscope.

Wallace, Sir William, Scottish patriot and hero: b. probably Elderslie, Renfrewshire, about 1272; d. London 24 Aug. 1305. Owing to the want of contemporary Scottish records, the real facts regarding his life and achievements remain in much obscurity, many incidents resting solely on the authority of Blind Harry, who wrote about 200 years later, and can hardly be regarded as a serious historian. Wallace is represented as having been for some years engaged in a partisan war against the English before what is represented by Blind Harry as the turning-point in his career took place, the burning of the town of Lanark and the murder of Heselrig, the sheriff. This incident is ascribed to May 1297. Soon after, he attacked Ormesby, the justiciar, while holding a court of justice at Scone, and Bek, bishop of Durham, at Glasgow, whom he put to flight. Among the followers of Wallace about this time was William of Douglas, the representative of a great Border family, which subsequently contributed invaluable aid to the war of independence. Sir Henry Percy and Sir Henry Clifford were sent to repress the Scottish rising. Wallace took most of the northern fortresses, and was besieging the Castle of Dundee, when he heard that the enemy was advancing upon Stirling. He took up a position encompassed by a loop of the Forth in front of the Abbey Craig, a hill near the Abbey of Cambuskenneth. Sur-

WALLACE—WALLACK

rey determined to attack him, and the English crossed the Forth on a narrow bridge from early morn till near noon, while the Scots were drawn up as spectators of their passage on the hill (11 Sept. 1297). When Wallace deemed the enemy sufficiently divided he attacked those who had crossed with his whole force, sending at the same time a detachment to secure and hold the head of the bridge. The victory was complete. Cressingham was killed, and Surrey fled to Berwick. After this Wallace appears with the title of guardian of the kingdom, which was temporarily cleared of the English, and is found conducting an invasion, or series of organized raids into England. In 1298 Edward entered Scotland with an army estimated at 7,000 men-at-arms and 80,000 footmen. Wallace retired before him, wasting the country, but was at length overtaken at Falkirk in a position where he was compelled to fight. He drew up his army on an inclined plain with his horsemen, about 1,000, in the rear (23 July 1298). The footmen were arranged in circles, the bowmen in the centre, and the spear-men in the front rank kneeling. In this order they resisted for a time the attacks of the English men-at-arms, but the circles were gradually broken, and the army routed. After this Wallace for a time disappears from the scene. The council of regency which succeeded him carried on the war for some time with spirit; but on 9 Feb. 1304 they and their followers were admitted to King Edward's peace. Wallace was excepted by name. He was then in the country, and every exertion was made to secure his apprehension. It was effected through Sir John de Menteith, governor of Dumbarton Castle. He was conveyed to London, through which he was carried on 22 Aug. 1305. He was put on trial at Westminster before a special commission, and was executed for treason and rebellion, though he had never recognized Edward, and the latter explicitly claimed dominion over Scotland as a conqueror only. He appears in literature in Porter's 'Scottish Chiefs' (1810), and Buchanan's 'Wallace: A Tragedy' (1856). Besides the histories of Scotland and others relating to the period consult the biographies by Carrick (3d ed. 1840); Tytler (2d ed. 1845); Moir (1886), and Muirson (1898); the edition of Blind Harry by Jamieson (1820); and Stevenson, 'Wallace Papers' (1842).

Wallace, William Harvey Lamb, American soldier: b. Urbana, Ohio, 8 July 1821; d. Savannah, Tenn., 10 April 1862. He removed with his father to Illinois in 1833, studied law and in 1846 was admitted to the bar. At the outbreak of the Mexican war he enlisted as a private, later becoming adjutant, and served at Buena Vista and in other operations until the end of the war, when he returned to his law practice. He became district attorney in 1853 and in 1861 he was appointed colonel of volunteers in the Union army. He commanded a brigade at Fort Donelson, February 1862, was promoted brigadier-general, and in the battle of Shiloh commanded Smith's old division. The brigade withstood an assault of six hours and was last to leave the field, Wallace falling, mortally wounded, in the resistance.

Wallace, William Vincent, Irish musical composer: b. Waterford 1 July 1813; d. Château de Bagen, in the Pyrenees, France, 12 Oct. 1865. He gave evidence of great musical ability, be-

came a skilful player on several instruments, and in 1829 was organist in Thurles cathedral. His enthusiasm was stimulated by hearing Paganini play in 1831, and in 1834 he played a violin concerto composed by himself. He went to Australia in 1835 and worked at sheep-farming. But soon returned to music, and traveled to New Zealand, where he had a romantic escape from assassination by the Maoris. His later travels proved very profitable from a financial point of view. He returned to London in 1845, and toward the end of that year his popular opera of 'Maritana' was produced at Drury Lane with great success. 'Matilda of Hungary' (1847) was damaged by an exceedingly bad libretto. After a voyage to America he again settled in England in 1853, and in 1860 'Lurline,' a better work than 'Maritana,' was produced with even greater success at Covent Garden. Other operas were the 'Amber Witch' (1861); 'Love's Triumph' (1862); 'The Desert Flower' (1863); and 'Estrella,' the last left unfinished at his death.

Wallace's Line, an imaginary line, so called in compliment to Alfred Russel Wallace (q.v.), separating the Oriental from the Australian faunas. It passes between the Sulu and Philippine Islands, along the Straits of Macassar and between Lombok and Java. The fauna west of this line is strikingly different from that east of it, although the opposite shores of dividing waters are sometimes only a few miles apart. See ZOOGEOGRAPHY.

Wallachia, wô-lă'k-ə, southern Europe, a former principality, united with Moldavia in 1861 to form the kingdom of Rumania. See RUMANIA.

Wallachian, or Cretan, Sheep, a variety of long-haired domestic sheep, bred in Wallachia and its neighborhood, remarkable for the development of the horns. The horns of rams spring almost perpendicularly from the frontal bone, and then take a beautiful spiral form; and those of the ewes protrude nearly at right angles from the head and then become twisted in a singular manner. The disadvantage of such head-appendages has led to the diminution rather than the increase of the breed.

Wallack, wôl'ak, James William, American actor: b. London 24 Aug. 1795; d. New York 25 Dec. 1864. He made his first appearance on the stage when a child. In 1813 he began his permanent career, playing as Laertes in 'Hamlet' at Drury Lane. He made his first visit to the United States in 1818, and subsequently for 20 years lived alternately in England and in the United States, playing at different times in all the principal cities of the Union. In 1820 he became stage manager at Drury Lane, and in 1837 opened the National theatre in New York. This was destroyed by fire in 1839, and in 1852 he opened Wallack's Lyceum, rebuilt as Wallack's theatre in 1861. His career as actor and manager was uniformly successful and in the presentation of comedy he had few equals. As a manager he was greatly aided by his knowledge of stage-effects and his artistic adaptation of scenery and costumes. Consult: Lester Wallack, 'Memories of Fifty Years' (1899).

Wallack, John Lester, American actor, son of James William Wallack (q.v.): b. New York 1 Jan. 1820; d. Stamford, Conn., 6 Sept.

1868. He made his debut as an actor in New York in 1847, succeeded his father as manager of Wallack's theatre, New York, in 1864, and conducted it with great success. He adapted several French comedies to the American stage, and in 1888 retired after having been identified with the American stage as actor and manager for 40 years. Consult his 'Memoirs of Fifty Years' (1889); Mackay and Wingate, 'Famous American Actors of Today' (1896).

Wallasey, wól'a-sí, England, an industrial town suburban to Liverpool, in Cheshire, two miles northwest of Birkenhead, near the seaward extremity of the Wirral peninsula, protected by the notable Wallasey embankment. The town has a workmen's institute, a 16th century reorganized grammar school, and is noted for its municipal ownership of public utilities, water, gas, electric-lighting, street railways, baths, cottage hospital, etc.

Wallenstein, väll'en-stín or wöl'en-stín (or more correctly WALDSTEIN), Albrecht Wenzel Eusebius, Von, duke of Friedland and Mecklenburg, and Prince of Sagan, German soldier: b. Hermanic, Bohemia, 15 Sept. 1583; d. Eger, Bohemia, 25 Feb. 1634. He studied under the Jesuits at Olmütz, and after accepting the Catholic faith finished his studies at the Universities of Altdorf, Bologna, and Padua. In 1717, on assisting the Archduke Ferdinand in the latter's war against Venice, he was raised to the rank of count and made a colonel. When Bohemia revolted, he raised a regiment of cuirassiers for the emperor and fought against Thurn and Bethlen Gabor. When the estates of the vanquished Bohemians were confiscated in 1620 and sold to imperial adherents at nominal prices, he purchased extensive tracts, including the domains of Friedland and Reichenberg. In 1623 he was made Duke of Friedland, and in 1624 his collective estates were elevated to a principality. He now applied himself to the care of these dominions. When the emperor was involved in new troubles by the Lower Saxon league in 1625 he offered to raise 20,000 men for the imperial service by his own efforts. In return, he was to have full control in the hostile provinces. Before he had completed his levy he was named generalissimo and field-marshal, and then set out at the head of 30,000 men to co-operate with Tilly (q.v.). On 25 April 1625, he gained a victory over Count Mansfeld at Dessau, and when that general proceeded at the close of the year to Hungary to join Bethlen Gabor, he followed and brought Bethlen to conclude a truce. In the campaign of 1627 he conquered Silesia, drove the Danish king out of Germany, and forced his way into northern Jutland, bought from the emperor the dukedom of Sagan, at a price in which his military expenses were reckoned. The estates of Mecklenburg having been forfeited in the war, he was invested in them, first as security for his expenses, and afterwards as a regular fief in 1629. The attempt to take Stralsund was wholly unsuccessful (1628). In 1630, owing to the jealousy of the nobles, Wallenstein was deprived of his command.

When Gustavus Adolphus invaded Germany, Wallenstein attempted to negotiate with him on his own account, but the distrust of the Swedish hero frustrating his intentions, he listened to the earnest entreaties of the emperor, and

again took the field, having procured a formal capitulation securing to himself almost absolute power. After some partial successes he encountered the King of Sweden at Lützen, 16 Nov. 1632, in which battle Wallenstein was defeated and Gustavus killed. After the death of the Swedish king he had reopened negotiations with the enemies of the emperor, by whose assistance he hoped to place himself at the head of affairs in Germany. The matter proceeded slowly as his offers were received with much mistrust, especially by the German princes; he resumed hostilities to make his value felt, then reopened negotiations. His proceedings were known at the court of Vienna; but he was at the head of an army largely consisting of foreigners, many of whose leaders were personally pledged to him alone. The emperor was not strong enough to remove him, and was base enough to have recourse to assassination. On 24 Jan. 1634, he signed a secret patent conferring the command of the army on Count Gallas, who was instructed to arrest Wallenstein and his associates, and throw them into prison. On 18 Feb. an open proclamation was made commanding the army to obey only Generals Gallas, Piccolomini, and others named. Wallenstein left Pilsen with some of his confidential associates on the 23d to take refuge in the fortress of Eger, which he reached on the 24th. Here he was assassinated on the evening of the 25th. The plenipotentiary of Saxony and Brandenburg had reached Zwickau, and the plenipotentiary of France Frankfort, on their way to Wallenstein's headquarters, when they received word of his death. The emperor openly rewarded the assassins, among whom were two Scotchmen and two Irishmen, Gordon, Leslie, Butler, and Devereux. Wallenstein's overtures to the enemies of the empire have been represented by his partisans as *ruses de guerre*.

A vigorous controversy has been waged over the matter. As an organizer and leader of armies he must be ranked among the great commanders. In a time of excessive confusion he maintained a statesmanlike control of difficult affairs. His career was made the basis of Schiller's trilogy of 'Wallenstein.' Consult the lives by Förster (1834); von Ranke (5th ed. 1895); Aretin (1846); Hurter (1855); Förster's ed. of the 'Briefe Wallensteins' (1828-9); Schebek, 'Die Lösung der Wallensteinfrage' (1881); Bilek, 'Beiträge zur Geschichte Wallensteins' (1886); Schulz, 'Wallenstein und die Zeit des dreissigjährigen Krieges' (1898). See THIRTY YEARS' WAR.

Waller, wól'ér, Edmund, English poet: b. Coleshill, Hertfordshire (now in Buckinghamshire), 3 March 1666; d. Beaconsfield 21 Oct. 1687. He was educated at Eton and King's college, Cambridge, and is said to have been returned a member of Parliament for Amersham in his 16th year. In 1625 he was returned for Chipping Wycombe, and he sat for other places in several parliaments, including the Long Parliament. On the death of his wife in 1634 he courted Lady Dorothea Sydney, whom he celebrated in his verses under the name of 'Sacharissa' and Lady Sophia Murray, whom he distinguished by the name of 'Amoret,' both without success. In Parliament he at first opposed the court party, but retained his place

in the Long Parliament, and openly expressed his royalist sentiments after the Civil War began. He was sent as a commissioner from Parliament to the king after Edgehill, and soon after this occurred the incident called Waller's plot. Its nature is not clearly understood, though Waller made an abject confession of all he knew, including the names of his confederates, some of whom, his near relatives, were put to death. This event in his life is introduced in Beatrice Marshall's story 'An Old London Nosegay' (1904). He was imprisoned for a year, fined £10,000, and exiled. During this exile the first collection of his poems was published in 1645. In 1653 he obtained permission from Cromwell to return to England, and in 1654 he addressed a 'Panegyric to the Lord Protector.' In 1656 he recommended him in another poem to assume the royal title. Shortly after a poem on the death of the lord-protector, he addressed one to the king on his majesty's happy return. The proceedings of Monk apparently had not been anticipated. He again sat in Parliament, at intervals of cessation, till the reign of James II. Burnet says his popularity in Parliament was great, but he did not take pains to understand its business, but only studied to gain applause, being a vain and empty, though a witty man. His poetry was celebrated for elegance and polish at a time when these graces had been comparatively little studied, but it is destitute of all great qualities. Consult: Gosse, '17th Century Studies' (1897).

Waller, Frank, American artist and architect: b. New York 12 June 1842. He was educated at the Free Academy in New York, studied art in Rome (1870-71), and the next year made a sketching tour in Egypt. He was a founder and the first president of the Art Students' League and since 1888 has devoted his attention to architecture. Among his paintings may be cited 'Tombs of the Caliphs' (1874); 'A Caravan in the Desert' (1878); 'Eventide: Venice' (1883); 'Hop Picking' (1885). He published 'Report on Art Schools' (1879).

Wallin, väl-lén, Johan Olof, Swedish poet and ecclesiastic: b. Dalarna, Sweden, 15 Oct. 1779; d. Upsala, Sweden, 30 June 1839. He studied at Upsala and in 1806 was pastor of the Royal Military Academy. He subsequently held pastorates at Solna, Ulriksdal and Vesterås, and in 1837 was made Archbishop of Upsala. His hymns and religious songs are in high repute in Sweden, and he was called by Tegner 'David's Harp of the North.' Among his poems are 'The Educator,' a didactic poem in Alexandrines; verses on George Washington, 'Homesickness' and 'The Angel of Death,' one of his best known poems. He was a notable pulpit orator. His collected works in two volumes appeared in 1878.

Wallingford, wöl'ing-fôrd, Conn., borough, New Haven County; on the Quannipiac River, and on the New York, New Haven & Hartford Railroad; about 22 miles south of Hartford and 12 miles north of New Haven. The borough has broad, regularly laid-out streets, lined with large elm trees. The chief manufacturing establishments are sterling silver, silver-plate and nickel works, rubber goods factory, and brass goods factories. Britannia and iron-ware

are among the manufactures. The government census of 1900 gives the number of industrial establishments of the whole town (which includes two villages, East Wallingford and Yalesville, besides the borough) as 73; the capital in plants, \$5,382,134; the number of wage earners, 2,270; amount paid each year in wages, \$1,160,551; amount paid annually for raw material, \$2,813,410; average annual value of products, \$5,238,280. The town is one of the oldest settlements in Connecticut; it received its present name in 1670. In 1850 a branch of the Oneida Community (q.v.) was located here. The property is now owned by the Free Masons and the State Masonic Home has been erected here. There are two banks; the national bank has a capital of \$150,000, and the two banks have deposits amounting to \$864,890. There are six churches, a public high school, The Phelps School for Girls, a number of graded schools, and a public library. Pop. (1880) 3,017; (1890) 4,230; (1900) 6,737. The population of the town is, (1890) 6,584; (1900) 9,001; (1910) 11,155.

Wallingford, Vt., a town in Rutland County, on Otter Creek and the Bennington & Rutland Railway, 9 miles south of Rutland, 59 miles southwest of Montpelier, and about 11 miles southwest of Killington Peak. Included in it are the villages of Wallingford, South Wallingford, and East Wallingford. It has 2 hotels, 4 churches, a public high-school, and manufactures of harness, tinware, coffins and caskets, and agricultural implements. Pop (1910) 1,719.

Wallis, wöl'is, John, English mathematician: b. Ashford, Kent, 23 Nov. 1616; d. Oxford 28 Oct. 1703. He was educated at Emmanuel College, Cambridge, took holy orders, and in 1647 became chaplain to a Yorkshire baronet. He was one of the first members of the scientific association which became later the Royal Society, and in 1649 was appointed Savilian professor of geometry at Oxford. He was particularly skilful in the art of cryptography, or deciphering; and having by this means been enabled to render considerable service to the royal cause, he was on the Restoration of Charles II. made one of the royal chaplains. In 1661 he was one of the divines appointed to revise the Book of Common Prayer; and when the Royal Society was founded in 1663 his name was included in the list of the earliest members; and he added much to the reputation of that body by valuable contributions to the 'Philosophical Transactions.' Among his mathematical works the most important are: 'Arithmetica Infinitorum'; 'Mathesis Universalis, sive Opus Arithmeticum'; 'Mechanica, sive de Motu Tractatus geometricus'; 'De Sectionibus Conicis Tractatus'; and his 'Algebra.' He also published editions of Archimedes, Ptolemy, Aristarchus, and Porphyry. His complete works, including various treatises on theology, were published at Oxford (1692-9).

Wallis, Sm Provo William Parry, English naval officer: b. Halifax, Nova Scotia, 12 April 1791; d. Funtington, near Chichester, England, 13 Feb. 1892. He entered the British navy as a midshipman in 1804; served against the French, and in the War of 1812 with the United States was second lieutenant on the Shannon. He

WALLIS—WALNUT

was on board this ship in the fight with the Chesapeake and upon the disablement of the captain and death of the lieutenant, Wallis took command and conducted the prize to Halifax, receiving promotion to commander in recognition of his services. He was aide-de-camp to the queen in 1847-51, and in the last named year was promoted rear-admiral. He became vice-admiral in 1857, admiral of the white in 1863, and of the fleet in 1877. Contrary to the usual rule of retirement at the age of 70 Wallis was retained on the active list until his death, and for many years he was the only surviving flag-officer who had fought in the Napoleonic wars and in the war with America in 1812.

Wallis, Severn Teackle, American lawyer: b. Baltimore, Md., 8 Sept. 1816; d. there 11 April 1894. He was graduated from Saint Mary's College, Baltimore, in 1832, and was admitted to the bar in 1837. He became corresponding member of the Royal Academy of History at Madrid in 1843, and in 1849 went to Spain as United States agent to examine the title to public lands in east Florida as affected by the treaty of 1819. He was elected to the Maryland legislature in 1861 and there took a firm stand against action of the North in regard to the Civil War. He was imprisoned by the Federal Government for 18 months together with other prominent Marylanders and then released. He resumed his law practice and in 1870 was elected provost of the University of Maryland. He published: 'Glimpses of Spain' (1849); 'A Discourse on the Life and Character of George Peabody' (1870); etc.

Wallis Archipelago, Pacific Ocean, a group of islands northeast of Fiji, with an area of 40 square miles. They were placed under a French protectorate in 1887, have a French resident, and are in regular communication with Nouméa. Pop. est. 4,500.

Wallkill (wál'kíl) River, a river taking its rise in Sussex County, N. J., and flowing north and northeast through Orange and Ulster counties, N. Y. About 6 miles from the Hudson it joins the Rondout Creek, and below the junction the stream is sometimes called the Wallkill. The Wallkill is about 120 miles in length and furnishes considerable water-power.

Wallon, vā-lôn, Henri Alexandre, French historian: b. Valenciennes, France, 23 Dec. 1812; d. 13 Nov. 1904. He was educated in the Normal School at Paris, and in 1840 was appointed to the chair of modern history and geography at the Sorbonne. He was elected to the Legislative Assembly in 1849 but resigned in the following year; became a member of the National Assembly in the year 1871; and in 1875-6 was minister of public instruction. The complete establishment of the republic was largely due to his amendment, the 'Amendment Wallon,' carried 30 Jan. 1875, which subsequently gave him the sobriquet 'Father of the Republic.' In 1876 he became a member of the senate. His writings include: 'De l'Esclavage dans les Colonies' (1847); 'Jeanne d'Arc' (2 vols., 1860); 'La Vie de Jésus et son Nouvel Historien' (1864); 'La Terreur, Etudes Critiques sur l'Histoire de la Révolution Française' (1872); 'Les Représen-

sentants du Peuple en Mission, etc.' (1793-41 5 vols., 1888-90): etc.

Walloon, wó-loonz', the inhabitants of the Ardennes plateau, Southern Belgium, who are chiefly of Celtic or Roman extraction, and speak the French language, in distinction to the northern inhabitants of German race and language. The name is probably analogous to that given by the Germans to other foreign races, as the Walachians, Gauls, Welsh, etc. See *Belgium, People*.

Walnut, a tree of the genus *Juglans*, and of the order *Juglandaceæ*. The species, of which about 10 have been described, are natives of the northern hemisphere, being confined to the temperate parts. In America they are found as far south as Mexico. They are characterized by rough bark, compound leaves aromatically fragrant when bruised, staminate flowers in catkins, pistillate flowers in few to many flowered racemes and followed by large drupes with inedible husks and hard nuts, the kernels of which are valued in some species for food, dessert or the oil they yield upon expression. A majority of the species are prized for park planting because of their hardness and the graceful form they acquire when well established. For this purpose the most esteemed in America is probably the black walnut (*Juglans nigra*), which has a range from the New England States to Minnesota and southward to the Gulf States, but has now become rare and costly. It is a graceful and imposing tree which often reaches 150 feet in height, has usually an erect trunk and a broad airy round top. It is also valued to some extent for its rough hard-shelled nuts which are often seen in the markets. Its wood is one of the most highly prized native woods, being used extensively for furniture making, interior finish of houses where "natural woods" are used, its deep brown tint making rich contrasting effects with other woods. Several other species also furnish nuts found in various markets where the trees are native and the husks of several are used for dyeing and tanning. The species most esteemed for its nuts is, however, the Persian or "English" walnut (*Juglans regia*), which is indigenous from China to southeastern Europe. It has been cultivated for centuries in the Mediterranean region, whence it has been taken to mild climates throughout the world. The tree is only about half as large as the preceding species but is much the same in appearance. Its nuts have smoother, softer shells and usually finer flavored kernels. This nut is one of the most important of the world. Only during the closing half of the 19th century, however, has it been grown commercially in the United States, and here only in California. The crop marketed in 1901 from this state was officially estimated at about 6,000 tons, worth a little more than \$1,000,000. Since the planting of orchards has been fairly active in the sections adapted to the tree the yields since that date have increased. In 1903, 825 car-loads were shipped to eastern markets. Besides these home supplies large quantities are imported from the Mediterranean region but these importations will probably dwindle into insignificance when Californian orchards come into full bearing.

Since the trees seem to be exacting in their

demands, the areas in which they can be cultivated are somewhat restricted. They are considered susceptible to frosts after their growth has started though fairly hardy while dormant; they seem to be unable to stand hot weather since the nuts are more or less injured; they seem to fail upon lands in which standing water is nearer the surface than 20 feet, also in soils with hard clay subsoil and in poorly drained soils. They are thus almost restricted at present to the deep alluvial soils of the four southern counties of California, but by planting varieties which vegetate late in the spring and by avoiding the conditions mentioned it is believed that the region of successful cultivation may be extended even into the northern counties. The seeds are planted about 12 inches asunder in nursery rows 4 feet apart, cleanly cultivated, irrigated during midsummer and hardened off by withholding the water in autumn. They will usually be under 2 feet in height when one year old when they are root-grafted to desirable varieties. The grafts will often grow 8 feet during the first year. Either when one year or two years old the plants are set in permanent quarters about 50 feet apart. Little pruning is needed except to correct bad form, the branches being started about 4 feet from the ground. The orchards are kept cleanly cultivated throughout the season, the first plowing in spring being at least 6 inches deep. Irrigation is also given if needed; always during the winter. The trees of even the most precocious varieties rarely produce profitable crops before six years old and ten years is nearer the average age. Trees reach full bearing when about twenty years old and continue for thirty years or more. Some trees in Europe are said to be more than 100 years old. When the nuts begin to fall they are shaken down, gathered by women and children usually and spread on trays to dry for a week. The nuts are then graded into sizes by passing them over sieves after which they are dipped in a bath of soda, chloride of lime and sulphuric acid to bleach the brown shells and give them the ecru tint demanded by the market. After dipping they are rinsed in clear water. Formerly sulphur was used for this purpose but it was found to impair the quality of the nuts and has been abandoned. After drying the nuts are again graded into light and dark. The latter with the broken ones are used by confectioners; the former are shipped to market in sacks holding about 110 pounds.

Consult: U. S. Dept. of Agriculture, Division of Pomology, 'Nut Culture in the United States.'

Walpi. See TUSAYAN.

Walpole, wôl'pôl, Horace, EARL OF ORFORD, English wit and letter-writer: b. London 5 Oct. 1717; d. there 2 March 1797. He was the fourth son of Sir Robert Walpole (qv.) He was educated at Eton and King's College, Cambridge, on leaving which (1739) he traveled two years on the Continent. Returning in 1741 he took his seat in the House of Commons as member for Callington, Cornwall, and he sat for various constituencies up to his resignation in 1767. He always took a lively but superficial interest in politics, inclining sentimentally to extreme opinions. His parliamentary career

requires no particular record, but it may be mentioned that in 1757 he exerted himself earnestly in behalf of Admiral Byng (see BYNG, JOHN). In 1747 he purchased Strawberry Hill, near Twickenham, where he erected a Gothic villa, laid out the grounds with minute ingenuity, and made it a principal business of his life to adorn and furnish it according to a fantastic but refined and educated taste, with objects of curiosity and antiquarian interest, rare prints, pictures, books, and manuscripts. His maintenance was provided for by some sinecure appointments. To his antiquarian taste he added authorship, first in verse and afterwards more extensively in prose, and in 1757 established a private printing-press at Strawberry Hill, at which he printed not only his own works but those of others, his editions often selling at very high prices on account of the small number printed. In 1791 he succeeded his nephew in the peerage. He never took his seat in the House of Lords, and appears to have avoided using his title. His works are numerous. His first publication was a description of Sir Robert Walpole's pictures, printed privately in 1747, under the title of 'Aedes Walpolianae.' In 1757 a popular satire appeared called 'A Letter from Xò Hò, a Chinese Philosopher at London, to his Friend Lien-Chi, at Peking,' 'Fugitive Pieces in Verse and Prose,' and 'Catalogue of the Royal and Noble Authors of England,' with lists of their works, appeared in 1758. 'Anecdotes of Painting in England' were published in 1762-71. 'The Castle of Otranto' (1764), a romance, regarded as the prototype of the work of the 'School of Terror,' which subsequently became popular, is very variously estimated. Praised by Byron and Sir Walter Scott, it is pronounced by Hazlitt dry, meagre, and without effect. 'The Mysterious Mother,' a tragedy, and 'Historic Doubts on the Life and Reign of Richard III,' appeared in 1768. The works on which his reputation now chiefly rests are his 'Letters,' of which the best edition is that edited by Peter Cunningham (1857-9), and 'Memoirs' and 'Journal,' a series embracing the reigns of George II. and III. from 1751 to 1763. Walpole is almost unanimously pronounced the best of English letter-writers, whose unflinching ease and vivacity in treating of politics, art, foreign affairs and other topics are unlike anything else in English literature. The memoirs are more bitter and cynical, but both are valued as a store-house of the more evanescent traits of contemporary history, being full of passing topics and occurrences, anecdotes, characters, and portraits. Though a keen and able he was not, however, an accurate or impartial observer. Want of depth and earnestness in his own character, his party prejudices, his vanity and love of effect, tempered all he wrote, and detract from the weight of his evidence. Few writers, however, are more uniformly entertaining. Walpole's manners were affected both personally and as a writer. He was as fastidiously aristocratic in his personal notions as he was sentimentally liberal in his political opinions, and in both he was probably conventional rather than sincere. Of the value of his writings as a chronicle of current events much has been made, but there is a tendency to ascribe to him elegance alone, to the neglect of his substantial

WALPOLE

literary merits. The complete works appeared in an edition of 1708. Consult further: Cunningham's edition of the 'Letters' (1857-9); Warburton's of the 'Memoirs' (1851); Robins, 'Catalogue of the Classic Contents of Strawberry Hill' (1842); Macaulay's essay in the 'Edinburgh' for October 1833; Cobbett, 'Memorials of Twickenham' (1872); Seeley, 'Horace Walpole and His World' (1884); and the 'Life' by Austin Dobson (1890; 2d ed. 1893).

Walpole, Sir Robert, EARL OF ORFORD, English statesman: b. Houghton, Norfolk, 26 Aug. 1676; d. there 18 March 1745. He was educated at Eton and King's College, Cambridge, and became a good classical scholar. On the death of his elder brother in 1698 he resigned his scholarship, in 1700 entered Parliament as member for Castle Rising, and in 1702 was elected for King's Lynn. He became a leader of the Whig party, and soon distinguished himself by attention to business, and, though not an orator, by practical debating power. In 1708 he was appointed secretary-at-war, and intrusted with the management of the House of Commons. He was one of the managers of the impeachment of Sacheverell (q.v.) (1710), though privately opposed to that measure. Soon after this the Whigs were dismissed from office. On the meeting of Parliament in 1712 he was convicted of a high breach of trust and notorious corruption, the charge being due wholly to party hostility. He was expelled from the House of Commons, and imprisoned in the Tower. By his party Walpole was regarded as a martyr. He refused to make any submission, and wrote a pamphlet in his own defence. He remained in prison, or held his levee in the Tower, till the prorogation. He was returned again for King's Lynn, after the dissolution in 1713, and resumed his place and influence in the House. In the first ministry of George I. (1714) he was appointed paymaster of the forces. He was also in 1715 made chairman of the committee to impeach the late ministers, Bolingbroke, Ormonde, Oxford, and Stafford. In October he was made first lord of the treasury and chancellor of the exchequer. In April 1717, a split having occurred in the ministry, Walpole resigned, and made himself formidable in opposition. He opposed the quadruple alliance and the South Sea Scheme, in which, however, he did not disdain to speculate and make a fortune. In 1720 he again took office as paymaster of the forces, and was intrusted with the measures rendered necessary by the failure of the scheme. (See **SOUTH SEA BUBBLE**). On the resignation of Sunderland he again became chancellor of the exchequer and first lord of the treasury, 3 April 1721, and for 21 years held the highest office in the state without interruption. During his long administration the Hanoverian succession, to which he was zealously attached, became firmly established, a result to which his prudence and political sagacity largely contributed. He promoted by an enlightened policy the commercial prosperity of the nation, and relieved the weight of taxation by many improvements in the tariff. He was the first English minister after the Restoration to make particular study of commerce and finance, and it was he who laid the basis for the free-trade

and colonial policies of Great Britain. To the war with Spain he was decidedly averse. In February 1742, two days before his resignation, he was created Earl of Orford. So long a period of office did not of course pass without opposition. In 1733 his important excise bill failed to pass, and during the later years of his ministry he encountered increasing difficulties. When, after successive defeats in Parliament, he resigned, he was consulted by the king as to his successors, and allowed to stipulate for his own immunity. An attack was soon, however, made upon him in Parliament, and a committee of secrecy appointed to inquire into his administration. The committee's report charged him with having used undue influence at elections, with granting fraudulent contracts, and with peculation and profusion in the use of the secret service money. The king exerted himself to frustrate the inquiry, and on the other hand the committee did not gain credit for impartiality. The prosecution against Walpole was dropped for want of evidence. He took little further part in public affairs, but was frequently consulted by the king. Walpole has been characterized by Burke as an 'intelligent, prudent, and safe minister.' He was ambitious for power, but had above his contemporaries an understanding of true national interests. Consult: Various standard histories of England; Coxe, 'Memoirs of Sir Robert Walpole' (1798); the studies by Ewald (1877) and John Morley (1890); 'Historical Sketches of the Reign of George II.' in 'Blackwood's' for April 1868; 'Original Papers' (ed. Macpherson 1775); King, 'Political and Literary Anecdotes' (1818); Macpherson, 'Annals of Commerce,' vol. iii. (1805); Courtney, 'Parliamentary Representatives of Cornwall' (1889).

Walpole, Sir Spencer, English historian, son of Spencer Horatio Walpole (q.v.): b. England, 6 Feb. 1839; d. London, 8 July 1907. He was educated at Eton and entered the war office in 1858. He became inspector of the fisheries in 1867, lieutenant-governor of the Isle of Man in 1882 and in 1893-9 was secretary to the post-office. He was knighted in 1898. He wrote 'A History of England from 1815' (1878-86); 'The Electorate and the Legislature' (1881); 'Life of Sir John Russell' (1889); 'The Land of Home Rule' (1893); etc.

Walpole, Spencer Horatio, English statesman: b. 11 Sept. 1806; d. London, 22 May 1898. He was educated at Trinity College, Cambridge, was called to the bar in 1831 and in 1846 became queen's counsel. He was home secretary in 1852 and in 1856-82 sat in Parliament for Cambridge University. He was again home secretary for a few months in 1858, and was an unofficial member of the cabinet in 1867-8. From 1887 until his death he was high steward of Cambridge University.

Walpole, Mass., town in Norfolk County; on the New York, New Haven & Hartford Railroad; about 20 miles southwest of Boston. It contains the villages of South Walpole, Walpole, and East Walpole. It was settled in the 17th century, but was laid out as a town about 1720, and in 1724 was incorporated. The chief manufacturing establishments are a furniture factory, paper mill, and cotton factory. There

are eight churches, a high school, and 15 district schools. Pop. (1910) 4,892.

Walpole, N. H., town in Cheshire County; on the Connecticut River, and on the Fitchburg Railroad; about four miles below Bellows Falls and 19 miles northwest of Keene. It is in an agricultural region, on a high bank which has an almost precipitous descent of several feet. The place was founded in 1745 on a site granted by Massachusetts in 1735, and in 1752 confirmed or re-granted, by New Hampshire. There are six churches, a high school, several graded and district schools, and a public library which contains about 6,000 volumes. The bank has deposits amounting to nearly \$300,000. Pop. (1910) 2,668.

Walpurga, wäl-poor'gä, **Walburga**, or **Walpurgis**, Saint, German abess: b. England; d. 778. She was sister of Saint Willibald, first bishop of Eichstadt, in Germany, and niece of Saint Boniface, the apostle of the Germans. She went, like her uncle and brother, to Germany as a missionary, and became, about the middle of the 8th century, abess of a convent at Heidenheim, in Franconia. She must have been a learned woman, as she was considered the author of a Latin description of the 'Travels of Saint Willibald.' After her death she received the honors of a saint, was believed to work many miracles, and chapels in honor of her were built in many places. From the circumstance that in German almanacs the name Walpurgis has been accidentally placed, sometimes alone, sometimes together with the names of the apostles Philip and James, against the first of May, the night previous to the first day of May, so famous in German legends for the assembling of the witches, has been called Walpurgis Night. The first of May is an important day for the German cultivator; many contracts are made at this time; the labors of the field assume new activity, etc. It is not strange that, on so important a day, the devil and the witches were supposed to be more active than usual, and to assemble in a particular place to organize the work of evil. This superstition, however, may have had its origin in the ancient German mythology. Hence straw was burned in many places on the Walpurgis night, with a view of dispersing the malignant beings—a custom still preserved in some places. The chief convocation of the witches was considered to take place on the Brocken. Many customs connected with the first of May in Germany originated in this superstition.

Walrus, or **Morse**, an arctic marine pinniped mammal of the genus *Odobenus*, of which two species are recognized—the Atlantic (*O. rosmarus*), and the Pacific (*O. pacificus*). The walrus is allied to the hair seals (see **SEALS**), from which it is distinguished by having the upper canine teeth largely developed, and growing from persistent pulps to form tusks. These may attain a length of 15 inches or more, and grow downwards, and slightly inwards. They serve the animal as weapons, as tools in digging up from the sand of the bottom of the sea the mollusks upon which it mainly subsists, and in climbing out upon ice-cakes or rocks of the shore. They are much larger in the males than in the females. The walrus is ordinarily 10 to 12 feet long, with a girth of nearly as much, but is said sometimes to attain a length of 20

feet. The muzzle is abruptly truncated, with long and remarkably strong bristly moustaches; small eyes; external ear wanting, though the orifice is distinctly visible; hind limbs short, connected by a membrane which covers the tail; fore limbs strong and stumpy, all with five digits. The hide is of a tawny brown color, with difficulty penetrated by bullets, and has been likened to a tough, flexible coat of mail.

Walruses are gregarious, and are found on the seashore and on ice floes. They are said to be monogamous, and the female brings forth at nine months one calf, usually on the ice floes. In disposition they are quiet and inoffensive unless attacked, or during the mating season, or when their young are in danger; when they become desperately aggressive, and furiously attack the hunters on the ice or in boats. The walrus is now confined to the regions within the Arctic Circle, though its extinct ancestors had a much wider geographical range, occurring numerous in ancient times as far south as Denmark and Nova Scotia in the Atlantic, and about the Aleutian islands on the northwest coast. Owing to reckless slaughter by sealers and whalers, they are greatly decreased even in the Arctic seas, and the few remaining seek unfrequented spots in high latitudes inaccessible to sealers. The tusks alone have now any commercial value, but formerly walrus hides were used for various purposes, such as machine bands, etc.

Consult Allen, 'North American Pinnipeds' (Washington 1880); and standard authorities.

Walsall, wäl'säl, England, a manufacturing town of Staffordshire, eight miles north-northwest of Birmingham. The environs present much fine scenery, and the town is handsomely built. The chief buildings and establishments are a modern parish church, with tower terminating in a lofty spire, and other places of worship; a free grammar, blue-coat charity, and other schools; a town-hall and jail; a public library and news-room; county court, a handsome structure with a Doric colonnade; a technical school; and four public parks. The situation of the town gives it great advantages for carrying on the iron manufacture, which forms a leading industry; the chief articles consisting of ironmongery, including coach and carriage harness mountings, buckles, chains, locks, keys, screws, files, edge-tools, gas-tubes, etc. Saddlery and harness are extensively made, and are the staple of the town. There are also brass and iron foundries, machine-shops, tanneries, and establishments for currying, dyeing, and japanning hides, malt-works, and clothing-factories; and in the vicinity extensive lime-works, and both coal and iron pits. Walsall is of considerable antiquity, but the existing town is almost entirely of modern origin.

Walsh, wölsh, Robert, American lawyer: b. Baltimore, Md., 1784; d. Paris, France, 7 Feb. 1859. He was educated at the Roman Catholic College, Baltimore, and at the Jesuit College, Georgetown, D. C., traveled in Europe until 1809, and on his return studied law, was admitted to the bar, and established a law practice at Philadelphia. Later he entered journalism, and in 1811-13 published the 'American Review of History and Politics,' the first quarterly issued in the United States. He edited the 'American Register' in 1817-18, and

in 1819 established the Philadelphia 'National Gazette,' which he conducted until 1836. He revived the 'American Review' in 1827 and edited it until 1837. He removed to Paris in 1836, was United States consul there in 1845-51, and continued his residence in that city until his death. He wrote: 'Letter on the Genius and Disposition of the French Republic' (1810); 'Appeal from the Judgment of Great Britain Respecting the United States' (1819); 'Didactics: Social, Literary, and Political' (1836); etc.

Walsingham, wôl'sing-am, Sir Francis, English statesman: b. Chislehurst, Kent, in or about 1530; d. London 6 April 1590. He studied at King's College, Cambridge, and traveled on the Continent until early in the reign of Queen Elizabeth. He was introduced to public service by Cecil. His first embassy is said to have been to France about 1561. He resided in France as ambassador from August 1570 to April 1573, and on his return was made principal secretary of state and a privy-councillor, and soon after knighted. In 1578 he was ambassador to the Netherlands, in 1581 to France, and in 1583 to Scotland. After having the chief direction of the measures for the discovery of Babington's conspiracy, he was appointed one of the commissioners for the trial of Queen Mary in 1586. He was afterwards made chancellor of the duchy of Lancaster. He retired from public life some time before his death. It is somewhat remarkable that so little is known of Walsingham's career; but he worked in secrecy and dealt mainly in intrigue. He is said to have had 53 private agents and 18 spies at foreign courts, and many stories are told of his diplomatic profundity. In his private character Walsingham is said to have been ascetically strict in his morals and puritanic in his religious zeal. An account of Walsingham's embassy to France appeared in a work by Sir Dudley Digges, entitled 'The Complete Ambassador,' published in 1655; and a work entitled 'Arcana Aulica' has been wrongly ascribed to Walsingham himself.

Walter, wâl'ter, John, English publisher: b. 1739; d. Teddington, Middlesex, 16 Nov. 1812. He was first engaged as a coal merchant, in which business he accumulated a considerable fortune, but lost it in subsequent operations as an underwriter. In 1782 his attention was attracted to an invention of one Henry Johnson, who had patented in 1778 and 1780 a printing device known as logotypes, or fonts containing entire words or syllables instead of letters. In 1784, having purchased the Johnson patents, he opened a printing office in London known as the Logographic Office, and engaged in publishing books. On 1 Jan. 1785 he issued the first number of a small newspaper, 'The Daily Universal Register,' "printed logographically," which was really the first number of the 'Times,' though that name was not assumed until 1 Jan. 1788, when 'The Times, or Daily Universal Register' appeared, the alternative title being dropped in the succeeding March. The 'Times' was not immediately a success, and the logographic process had eventually to be abandoned, but Walter seems to have derived some profit from his book printing, and gradually the 'Times' became a power in the land. In 1786, however,

Walter was convicted of having printed a "libel," the offense having been the statement that the Dukes of York, Clarence, and Cumberland were insincere in their congratulations on the king's recovery. He was sentenced to a year's imprisonment in Newgate, to stand in the pillory for one hour, pay a fine of £50, and to enter into recognizances for his good behavior for seven years. He was subsequently sentenced to a second year's imprisonment before the expiration of the first and further fines of £200 on other libelous charges, but was pardoned after 16 months at Newgate. Broken in health and spirit at his continued misfortunes Walter retired from the management of the business in 1795.

Walter, John, English editor and publisher, son of the preceding: b. London 23 Feb. 1776; d. there 28 July 1847. He was studying for the ministry at Oxford, when in 1797 or 1798 his father summoned him to London to assist in the management of the 'Times.' From the date of his assumption of the management a new spirit was manifested in the paper, and in 1803 he became sole manager. He maintained an independent course, which, while it made the reputation of the 'Times,' cost it editor the little official patronage it had enjoyed. For 18 years the firm had been printers for the board of customs, but in 1805, in consequence of criticism of Lord Melville's administration of the admiralty department, he was deprived of the employment. His enterprise had increased the circulation of the 'Times' from 1,000 to 5,000 copies in 10 years, notwithstanding the continued opposition of the government. In 1805 he made arrangements for obtaining foreign news and in 1807 sent Henry Crabb Robinson (q.v.) to Germany, the first of the afterward numerous class of special correspondents; and though every measure possible was used by the government to delay his foreign despatches, Walter frequently published foreign information days before the same intelligence was officially received by the government. He afterward frankly admitted that smuggling was the only means by which he could obtain French journals. Ultimately the 'Times' took its place as the leading English journal, and Walter may be considered as its real creator. On 29 Nov. 1814 he issued his paper printed by König's steam machines, the first paper to be printed by that method. He acted as editor of the paper until after 1810, but from that time entrusted a share of the editorial work to Sir John Stoddart. In 1832-7 he sat in Parliament for Berkshire, but resigned in the latter year because of differences with his constituents; was returned for Nottingham in 1841, but was unseated in the following year. His later years were spent chiefly in retirement.

Walter, Thomas Ustick, American architect: b. Philadelphia, Pa., 4 Sept. 1804; d. there 30 Oct. 1887. His early training was received in the office of William Strickland, and in 1830 he launched out for himself, building the Moyamensing Penitentiary in 1831. In 1847 he completed Girard College from his own designs, a building which has always been admired for the classic purity of its proportions. This classical motif he carried out also in his extension of the national Capitol at Washington, D. C., to which he added its noble dome.

WALTERBORO — WALTHAM

He erected many public buildings at Washington, including the Post-office, and the Government Hospital for the Insane. He was one of the original members of the American Institute of Architects, professor of architecture in Franklin Institute, and lecturer on architecture in Columbia College.

Walterboro, S. C., town, county-seat of Colleton County; on the Charleston & Savannah Railroad (Plant System), about 20 miles west of Charleston. It is in an agricultural region, in which cotton is one of the chief products. It has cotton mills, lumber mills, naval stores, lumber yards, and large store houses. The two banks have a capital of \$35,000. Pop. (1910) 1,690.

Walters, wâl'ters, William Thompson, American merchant and art collector: b. on the Juniata River, Pa., 23 May 1820; d. Baltimore, Md., 22 Nov. 1894. He was educated to be a civil engineer, but became interested in the coal and iron industry, and while in charge of a smelting establishment in Pennsylvania produced the first iron manufactured from mineral coal in the United States. He removed to Baltimore in 1841, and established himself as a wine merchant there in 1847. He was president of the first steamship line between Baltimore and Savannah and was one of the reorganizers of the Southern lines. In 1861-5 he resided in Europe, where he traveled widely in the interest of art, and purchased numerous additions for his collection. He was United States commissioner at the Paris expositions of 1867 and 1878, and also to that at Vienna in 1873. He was a trustee of the Corcoran Art Gallery at Washington, D. C., and of the Peabody Institute. His private collection was one of the largest and most valuable in the United States, and his annual exhibit of his gallery for charity netted \$30,000 for the poor of Baltimore. He wrote: 'Barye' (1885); 'Notes Upon Certain Masters of the 19th Century' (1896); etc.

Walthall, wâl'thal, Edward Cary, American soldier: b. Richmond, Va., 4 April 1831; d. Washington, D. C., 21 April 1898. Admitted to the bar in 1852, he began practice in Coffeeville, Miss., and was district attorney for the 10th judicial district of Mississippi 1866-61. He then entered the Confederate army as lieutenant, becoming brigadier-general in December 1862 and major-general in June 1864. He especially distinguished himself at the battle of Missionary Ridge, where he led his brigade over a ridge and held back the Federal troops till the Confederate army made its escape; and he covered the retreat of General Hood's army after the defeat at Nashville. He practised law in Grenada, Miss., 1871-85, when he was appointed a United States Senator to fill out the unexpired term of Lucius Q. C. Lamar. He was elected for full term in 1888 and in 1892, was chairman of the committee on military affairs, and served on the committees on the improvement of the Mississippi River and on public lands.

Waltham, wâl'tham, Mass., city in Middlesex County; on the Charles River, and on the Boston & Maine Railroad; 10 miles west of Boston. It is connected by electric railway with Boston, Newton, and many of the places in the vicinity.

Industries.—The chief manufacturing establishments are the two watch-making works. At the American Waltham Watch Works, the first successful attempt was made to manufacture watch movements, on a large scale, by machinery. It is now the largest watch factory of its kind in the world. In 1814 a cotton mill was erected here, the first in the United States in which, under the same roof, the raw material was put through all necessary forms, even through the bleachery and the dye works, and came out the finished cotton cloth of the market. Other manufactories are saddlery and harness works, foundry and machine shops, wagon and carriage factories, emery wheel works, lumber mills, furniture factories, and men's clothing factories. In 1909 (government census) Waltham had 80 industrial establishments—employing 6,287 persons, to whom was paid annually \$3,695,000. The cost of the materials used each year was \$2,444,000, and the plants were capitalized for \$12,871,000. The value of the annual products was \$7,814,000.

Public Buildings and Municipal Improvements.—The principal public buildings are the government building, the municipal buildings, banks, churches, and schools. There is one large park and a number of small squares. The waterworks are owned and operated by the city. The main business streets and many of those in the residential sections are paved. The roads leading to the near-by villages and towns are well made and kept in good repair. The pure water, favorable climate, and good sewerage make the place most healthful.

Churches and Schools.—There are 15 churches representing 10 different denominations. The educational institutions are the Massachusetts School for the Feeble-Minded, the Waltham Nurses' Training School, the Notre Dame Normal Training School, a public high school and two private schools doing high school work: Saint Mary's School (R. C.) and Waltham New Church School (New Jerusalem Church). There are several commercial schools and Mellor's Commercial College, public and parish graded elementary schools, public evening schools, several private schools, a public library which contains about 30,000 volumes, and several school libraries.

Banks.—There are two banks, one national and one state bank. The national bank has a capital of \$150,000; and the two banks have deposits amounting to \$4,183,990, the state bank alone has deposits of \$3,459,990. The surplus and profits are \$206,970.

Government.—The government is administered under a charter of 1893 which provides for a mayor elected annually and a common council. The mayor appoints, subject to approval of the council, the majority of the administration officials, but the board of education is chosen by popular vote.

History.—Waltham was settled by farmers in the early days of the colony. The first incorporation was that of Watertown, which then embraced the territory now included in Waltham. In 1738 Waltham was set off from Watertown and incorporated as a town; and in 1884 it was granted a city charter.

Pop. (1900) 23,481; (1910) 27,834.

Consult Hurd, 'History of Middlesex County.'

WALTHAM ABBEY — WALTON

Waltham Abbey, or Waltham-Holy-Cross, England, a market town of Essex, 12 miles north by east of London, on the left bank of the Lea. It consists chiefly of one irregular main street; and has a spacious Norman church, which once formed the nave of the famous abbey church of the Holy Cross, where King Harold is buried. There are here government manufactures of gunpowder and percussion-caps, cordite, and small-arms, besides breweries, flour-mills, etc. The old abbey of Waltham was founded or enlarged by King Harold in 1060, and is said to have once possessed a fragment of the cross on which Christ suffered. In the neighborhood are the village of Waltham Cross, and an 'Eleanor cross,' recently restored. Pop. about 8,000.

Walther von der Vogelweide, wäl'tër fôn dër fô'gël-vî-dê, German lyric poet of the class of *Minnesingers*: b. about 1160; d. about 1227. He was descended from a noble but not wealthy family, whose castle, Vogelweide, is supposed to have been situated in Tyrol. Walther resided at the court of Frederick, the eldest son of Leopold VI., duke of Austria, and on Frederick's death in 1198 left the court of Vienna and entered on a series of wanderings. He remained longest at the splendid court of the Landgrave of Thuringia, who had always around him a circle of poets, and instituted that celebrated poetic contest, the war of the Wartburg (1207), in which Walther took part. Walther shows himself, in his political poems, a warm partisan of the imperial interests against the Papacy. The Emperor Frederick II. was also a patron, and bestowed on him a small fief. His poems, all of which are lyric, have been published by Lachmann (1827). Consult: Milmanns, 'Leben und Dichten Walthers von der Vogelweide' (1882); Schönbach, 'Walther von der Vogelweide, ein Dichterleben' (1895).

Waltner, wäl't-nâr, Charles, French copper-plate engraver and etcher: b. Paris 24 March 1840. He studied painting under Gerome and took up engraving with Martinet and Henriquet-Dupont. In 1868 he carried off the Prix de Rome. As an etcher and engraver he has been very successful in reproducing paintings in black and white. His chief works are 'Portrait of the Baron von Biege,' after Rubens (1870); 'The Infanta Marguerete,' after Velazquez; 'Rembrandt,' after the portrait by that master himself; 'The Entombment,' after Vandyck; the 'Angelus,' after Millet; 'Christ Before Pilate,' after Munkacsy (1882); 'The Watch,' after Rembrandt (1885); and 'Portrait of a Rabbi,' after Rembrandt.

Walton, wâl'tôn, Brian, English Biblical scholar: b. Yorkshire 1600; d. London 29 Nov. 1661. He was graduated at Cambridge and from a curacy advanced through many preferments to a prebend in Saint Paul's. At the Restoration he was made chaplain to Charles II. and bishop of Chester. His greatest work is 'Biblia Sacra Polyglotta' (6 vols. folio 1657). This work comprises the Hebrew original of the Old Testament, the Samaritan Pentateuch, the Chaldee, Syriac, Arabic, Persian versions, and the Latin Vulgate with various readings, notes, etc., still thought to be 'the most complete Biblical apparatus in any language.' He wrote in 1658 his 'Dissertation on the Antiquity and Authority of His Texts,' in later editions called the

'Prolegomena,' under which name it was published in the original Latin (1827-8). 'The Considerator Considered,' etc. (1659), was written in answer to Dr. John Owen's 'Vindication of the Purity and Integrity of the Hebrew and Greek Texts,' etc., a criticism on Walton's great Biblical work.

Walton, George, American patriot: b. Frederick County, Va., 1740; d. Augusta, Ga., 2 Feb. 1804. He was apprenticed to a carpenter, but studied law at night by the light of pine-knots, in 1774 was admitted to the bar, and began practice in Augusta. Together with three others he called a meeting at Savannah 27 July 1774 for the purpose of discussing measures of resistance against the arbitrary proceedings of Great Britain and was one of a committee inviting co-operation from the sister colonies. Later he was one of the committee which prepared a petition to the king and in 1776 was sent as a delegate to the Continental Congress. He was one of the signers of the Declaration of Independence, and continued a delegate to Congress until 1781. He was appointed colonel of militia in 1778 and commanded a battalion under Howe when Savannah was captured by the British in September 1778, was seriously wounded, taken prisoner, and held until September 1779. He was chosen governor of Georgia in the following month, was chief justice of the State in 1783, 1787, and 1793; re-elected governor of Georgia in 1789, and in 1795-6 was United States senator.

Walton, Isaak, English author: b. Stafford 9 Aug. 1593; d. Winchester 15 Dec. 1683. After receiving a school education in his native town he went to London and was apprenticed to an ironmonger. In 1618 he was made free of the Ironmongers' Company and seems to have retired with a competency in 1644. The statement frequently made that he was a sempster or haberdasher is unsupported by recent research. He early became closely acquainted with Dr. John Donne, Sir Henry Wotton, and other famous men; and was a strong royalist and the friend of prominent royalists. Doubtless, after Marston Moor, he devoted himself much to fishing. Walton's fame rests on 'The Compleat Angler, or the Contemplative Man's Recreation: Being a Discourse of Fish and Fishing, Not Unworthy the Perusal of Most Anglers.' It was published in 1653, and went through five editions in his lifetime. The 5th edition, issued in 1676, contained, as a second part, Charles Cotton's treatise on fly-fishing, written to correspond with Walton's, and designated 'Instructions how to Angle for Trout or Grayling in a Clear Stream.' The chief subsequent editions are those by Moses Browne (1750), Sir John Hawkins (1760), Major (1824), Sir Nicholas Harris Nicolas (1836), Jesse and Bohn (1856), Marston (1888), Harting (1893), Lang (1896). There is a facsimile reprint of the first edition by Elliot Stock (1876), republished in 1877, 1880, and 1896. Lowell wrote the introduction for an American edition of 1889. Walton also wrote almost equally famous biographies of John Donne (1640), Sir Henry Wotton (1651, in 'Reliquiæ Wottonianæ'), Richard Hooker (1665), George Herbert (1670), and Robert Sanderson (1678). The first four were published together in 1670, and have been often reissued, as for instance, under the editorship

WALTON--WAMPUM

of A. H. Bullen (1884) and Austin Dobson (1898). Besides the short pieces of poetry in his works, Walton wrote other occasional and prefatory verses, which are to be found in R. H. Shepherd's 'Waltoniana' (1878). The charm of 'The Compleat Angler' is due to its purity and simplicity of style, the ease and unaffected humor of the dialogue, and its exquisite pictures of natural scenery, combined with the picture that it presents us of the writer's own sunny and benevolent nature.

One Richard Franck, a Commonwealth soldier, displayed his contempt of a royalist angler's practical acquirements in his 'Northern Memoir' (1694). Consult further the lives by Zouch (prefixed to the 'Lives' in 1796; separately printed 1823); Nicolas (prefixed to the edition of the 'Compleat Angler' 1836), the basis of later works; Marston (1888); also Tweddell, 'Isaac Walton and the Earlier English Writers of Angling' (1854), and Blakey, 'Literature of Angling' (1856).

Walton, N. Y., village in Delaware County; on the New York, Ontario & Western Railroad; about 175 miles northwest of New York, and 18 miles southwest of Delhi. It is in an agricultural and dairy region, and the industries are connected with farm and dairy products. It has a foundry, machine shops, novelty works, and furniture factory. There are eight churches, a high school, graded elementary schools, and a school library. There is one national bank capitalized for \$50,000, with deposits amounting to \$450,000. Pop. (1920) 3,103.

Waltz, a dance executed by any number of couples, the gentleman having his arm around his partner's waist, the couple wheeling round on an axis of their own, and at the same time moving round the room. The music is written in triple time in crotchets or quavers. Compositions in waltz form are often not intended for dance tunes. See DANCING.

Walworth, wäl'wérth, Ellen Hardin, American writer: b. Jacksonville, Ill., 20 Oct. 1832. She was married to M. T. Walworth (d. 1873) in 1852. She was one of the three founders of the National Society of the Daughters of the American Revolution in 1890; was director-general of the Women's National War Relief Association in 1898; and one of the first three women elected to the school board under the New York law. She has been prominent in various club movements, and has lectured and written extensively. Her writings include: 'Battles of Saratoga' (1891); 'Parliamentary Rules' (1897); etc.

Walworth, Jeanette Ritchie Hadermann, American novelist: b. Philadelphia, Pa., 22 Feb. 1837. She was carefully educated and at 16 became a governess, but was shortly afterward married to Douglas Walworth, of Natchez, Miss. She has lived in different parts of the South, but has made her permanent home in New York. Her publications include: 'Forgiven at Last' (1870); 'Dead Men's Shoes' (1872); 'The Bar Sinister' (1885); 'Splendid Egotist' (1889); 'The Silent Witness'; 'An Old Fogey'; 'New Man at Rossmere' (1903).

Walworth, Reuben Hyde, American jurist: b. Bozrah, Conn., 26 Oct. 1789; d. Saratoga, N. Y., 21 Nov. 1867. He was mainly self-taught,

was admitted to the bar in 1809 and settled at Plattsburg, N. Y. He became master in chancery in 1811 and soon rose to eminence in his profession. He sat in Congress 1821-3, removing to Saratoga in the last-named year, was a circuit judge 1823-8 and chancellor of New York 1828-48. His decisions as circuit judge are included in 'Cowan's Reports' (9 vols. 1824-30); as chancellor, in 'Paige and Barbour's Reports' 14 vols. (1830-49). He published 'Rules and Orders of the Court of Chancery' (1829); 'Genealogy of the Hyde Family' (1864).

Wampanoag ("Eastern land"), a tribe of the Algonquian stock of North American Indians, closely related to the Massachusetts tribe, whose language they spoke. They were sometimes called Pokanokets, from their principal village, and Massasoits, from a prominent chief. The Wampanoags resided on Narragansett Bay, in Bristol County, R. I., and Bristol County, Mass., but originally they claimed the territory between Narragansett Bay and Pawtucket River and the Atlantic, including the islands of Nantucket and Martha's Vineyard. The Cape Cod branch of the tribe were visited by Gosnold in 1602, and by other whites at an early date. In 1617 many of their number perished from disease, prior to which time they claimed to have had 5,000 warriors, or about 18,000 souls. When the Plymouth Colony was planted in 1620 the Wampanoags inhabited 30 villages; Massasoit was their chief, and the treaty which he made with the colonists was faithfully observed by him until his death. He was succeeded by his son, popularly known as "King Philip," who, chafing under the ill-treatment which his people had suffered at the hands of the whites, aroused the resentment of all the Algonquian tribes from the Merrimac to the Thames (except the Wampanoags of Cape Cod and Martha's Vineyard), and in 1675 began a war against the whites which continued for two years and proved to be the most disastrous Indian conflict in New England history. The Indians were ultimately overcome, but not until Philip and other leading chiefs had been killed, and the Wampanoags and Narragansetts almost exterminated. Those who could, fled to the interior tribes, many captives were sold as slaves, and others joined the various "praying Indians" of southern Massachusetts.

Wampum, or **Shell Money**, a general name given to certain shells or shell-beads used as a medium of exchange among the Indians of the Atlantic Seaboard States. Not merely did it serve the Indian as a medium of exchange and a standard of values, but worn as an ornament it was his badge of wealth and position, in the hands of the chiefs his record book and ledger, and through the favor of the Great Spirit its possession became in no small degree the passport to the happy hunting grounds of the future world. The use of wampum constituted a bond of union among the Indians such as was scarcely supplied by language, religion or racial customs. Wampum was made from shells, usually clam or oyster, and it was therefore not surprising that the coast dwellers were the most prolific producers of it. The black beads were made from the dark "eye" of the shell, the scar indicating the point of muscular attachment, while the white ones were taken

WANAMAKER—WANTAGE

from the outer parts. Black beads were known as sacki, white ones as wompi, and the black were usually considered twice as valuable as the white. The beads themselves were simply little shell cylinders about one eighth of an inch in diameter and one fourth of an inch in length. They were polished smooth by being rubbed against stones, and were bored by means of a flint awl, many of which are still to be found in the shell heaps along the New England coast. The English colonists were compelled to use wampum as a medium of exchange with the Indians for over half a century. Rhode Island recognized it officially as late as 1670. In New York it was used until after the end of the century—as for instance in the payment of the ferry between New York and Brooklyn. It was used in Southern Connecticut as late as 1704, and in the backwoods regions of the northern and middle colonies well down into the 18th century.

Wanamaker, wōn'a-mā-kér, John, American merchant: b. Philadelphia 11 July 1838. He received a common school education, and began his business career at 14 as errand boy in a store. In 1861 he established, with his brother-in-law, a clothing store under the firm name of Wanamaker & Brown, which in 1869 became the firm of John Wanamaker & Co. From this beginning he built up a department store which is the largest in the city, and in 1896 established a similar store in New York in the building formerly occupied by A. T. Stewart's firm. In 1903 he began the construction of a larger building in New York, which is to be a station of the subway. He has been active in the public life of Philadelphia, taking a prominent part in the movement to secure pure water for the city, in 1886-87, and in other reform movements, and has taken part in State and national politics as an "anti-machine" Republican. In 1888 he was a presidential elector, and in 1889 entered President Harrison's cabinet as postmaster-general. During his term of office he established the sea post-offices, and strongly favored a postal telegraph system. He has taken an active part in religious work, was for several years president of the Philadelphia Young Men's Christian Association, and in 1858 organized a small Sunday-school which became the Bethany (Presbyterian) Sunday-school, one of the largest in the United States.

Wan'spurn Indians ("river people"), a tribe of the Shapthian stock of North American Indians—the Sokulks of Lewis and Clark. They range along both banks of the Columbia in Washington, from above Crab Creek down to the mouth of Snake River. Having never made a treaty or gone on a reservation, they are not yet officially recognized by the government. Pop. about 200.

Wandering Cells, or **Phagocytes**. See **PHAGOCYTOSIS**.

Wandering Jew. See **JEW**, **THE WANDERING**.

Wandering Jew, a name applied to various plants—in Great Britain to the beefsteak or strawberry geranium (*Saxifraga sarmientosa*) and to the Kenilworth ivy (*Linnæa cymbalaria*). *Zebina pendula*, a leafy rapidly growing plant, with lance-ovate leaves, glossy and bright green or purplish above with broad silvery

stripes, is also known as the wandering Jew; it will grow either in sun or shade, or in water alone. Another wandering Jew is a spider-wort (q.v.).

Wan'darley, João Maurício, BARON COTEGRZ, Brazilian statesman: b. Barro do São Francisco, Pernambuco, Brazil, 23 Oct. 1813; d. Rio de Janeiro, Brazil, 13 Feb. 1889. He studied law and soon entered politics, joining the Conservative party, and from 1842 was repeatedly elected deputy. In 1856 he became senator, holding the office until his death and acting as president of the body in 1882 and 1885. He was created a baron in 1868, was minister to the Platine republics in 1870, and concluded the treaty of peace with Paraguay. He was a cabinet officer in nearly all the Conservative cabinets and in 1885 organized the ministry which secured the general emancipation law.

Wanderoo', or **Wandru**, a large monkey (*Macacus silenus*) of southern India, especially the country bordering the Malabar coast. The wanderoos have long, slim bodies, covered with black hair, and tufted tails. The head looks very large, because of a mane, or ruff, and beard, which sticks out around the face, and is either gray or white, enhancing the sly look of the broad face, dull eyes, and broad muzzle.

The name is also given generally to monkeys of the genus *Semnopithecus*. *S. ursinus* is the great wanderoo of Ceylon, and Eastern zoologists think the term should be restricted to this species alone.

Wandsworth, wāndz'werth, London, England, a metropolitan and parliamentary borough on the south side of the Thames; area 9,130 acres. Wandsworth proper is situated close to the Thames, near the mouth of its small tributary, the Wandie, and is built between and on the slopes of two hills. New Wandsworth, a suburb of recent growth, lies to the east and south of both stretches of Wandsworth Common, beside which are the Surrey County prison, the county lunatic asylum, etc. There are many important industrial establishments. Pop. about 250,000.

Wang Shih-fu, wāng'sh'foo, Chinese dramatic poet. He lived in the 13th century, was the creator of the Chinese opera 'Thau-Khi,' and composed 13 plays, of which only two survive. The 'Hsi Hsiang Chi,' or 'Story of the Western Pavilion'—like all Chinese plays, a sort of novel in dialogue—is his best work and obtained and still holds great popularity with the Chinese. It has been called by Giles "of all plays of the Mongol dynasty, the one which will best repay reading." The other is the comedy, 'The State Minister's Feast.' The former was partly translated into French by Stanislas Julien (q.v.), the eminent French sinologist, in 'Europe Littéraire.'

Wantage, wōn'tāj, England, a market-town in Berkshire, in the fertile vale of the White Horse, 13 miles southwest of Oxford. There are an interesting old church, a town-hall, corn exchange, grammar school, and cottage hospital. Iron and brass founding, and the manufacture of sacks and similar articles are carried on. King Alfred, to whom there is a statue by Count Gleichen, erected in 1877, was born at Wantage, as was also Bishop Butler. Pop. about 4,500.

WANX RIVER--WAPPINGER

Wanx River. See **CAPE RIVER.**

Wapakoneta, wá'pá-kón-ét'a, Ohio, village, county-seat of Auglaize County; on the Auglaize River, and on the Cincinnati, Hamilton & Dayton Railroad; about 30 miles north of Piqua and 13 miles south by west of Lima. It is in an agricultural region and in the natural gas and petroleum belt. The place was visited by whites in the early part of the 19th century, and some settlements were made. It was laid out as a village in 1833. Where the village now stands was the site of an Indian village of importance, the meeting place of certain tribes. In 1831 it was the scene of the signing of the treaty whereby the Shawnees and Senecas relinquished their lands to the government. Wapakoneta was the last place in Ohio occupied by the Indians. The chief manufactories are furniture, wheels, machinery, and furnishings for dairies, and a machine shop. There are three banks, two national and one private. The national banks have a combined capital of \$300,000 and deposits amounting to \$1,245,400. Pop. (1910) 5,349.

Wapello, wá-pil'ó, Iowa, town, county-seat of Linn County; on the Iowa River, and on the Burlington, Cedar Rapids & Northern Railroad; about 31 miles north of Burlington, and 20 miles south of Muscatine. It is in a rich agricultural region in which the principal products are wheat, corn, vegetables, and fruit. Considerable attention is given to stock-raising. The manufacturing establishments are flour and lumber mills, fruit and vegetable canneries, agricultural implement shops, and creameries. The town makes large shipments of grain, canned goods, hay, and live stock. There are two banks, one State and one private. Pop. (1910) 1,326.

Wapentake, or **Wapentac**, in England, an ancient county among some of the northern shires, still retained in Yorkshire. It corresponds to the "hundred" of the southern counties. The word means "weapon-touching" and refers to the custom of the chiefs of a particular district meeting at a certain day at a specified spot, when the head chief, alighting from his horse, raised his spear in the air, and the inferior chiefs, also on foot, touched this spear with their lances, and so acknowledged their fealty.

Wapiti, an Indian name of the great North American deer (*Cervus canadensis*) known in the West as "elk," but more like the red deer than the European or true elk (q.v.). It formerly ranged from the mountains of the Carolinas to lat. 56 to 57° N., but now nearly extinct, except in the northern Rocky Mountains. It is closely allied to but considerably larger than the stag, standing about 64 inches at the shoulder; yellowish brown on upper parts; sides gray, long coarse hair in front of neck, like a dewlap; antlers large, often exceeding 4 or even 5 feet in length; brow-tine duplicated. The wapiti resembles the Old World stag or red deer rather than the elk. In the Northwest it is represented by several related species, but the Eastern wapiti seems doomed to extinction as a wild animal. During the winter these noble animals gather in large herds and feed on the open hills. The antlers are shed about March, and the new ones are complete by

September. The bucks fight fiercely and not infrequently with fatal result at the pairing season; and the stronger ones are polygamous, gathering into their herds every available cow and guarding them and the young with jealous care. They eat almost everything of a vegetable nature, leaves and twigs as well as grass and herbs. During the summer, when they are much troubled by mosquitoes and flies, they are fond of entering the water and of wallowing in mud holes. See **DUM.**

Wappene, wá-pil'óos, Johann Eduard, German geographer: b. Hamburg 17 May 1812; d. Göttingen 16 Dec. 1879. He was educated at the universities of Göttingen and Berlin, and in 1833-4 traveled in Brazil and the Cape Verde Islands. He became a tutor at Göttingen in 1838, was appointed adjunct professor there in 1845, and from 1854 until his death was full professor in that university. His most widely known work is his edition of the Stein-Hörchelmann 'Handbuch der Geographie und Statistik' (1871), of which he wrote the volumes on 'Universal Geography' (1849); 'North America' (1855); 'Central and South America' (1867); and 'Brazil' (1871). His other writings include: 'Untersuchungen über die geographischen Entdeckungen der Portugiesen unter Heinrich dem Seefahrer (1842)'; 'Deutsche Auswanderung und Kolonisation' (1846); 'Allgemeine Bevölkerungsstatistik' (1859-61); etc.

Wap'patoo, an aboriginal name of the root of the common arrowhead (*Sagittaria variabilis*) which was a favorite food of the North American Indians.

Wappers, wáp-ár, Gustav, BARON, Belgian painter: b. Antwerp 23 Aug. 1803; d. Paris 6 Dec. 1874. Educated at the Art Academy of his native city under Van Bree and Herreyna, he went to Paris and devoted himself to copying the masterpieces of the Venetian School and subsequently studied the style of Rubens, Jordans and the Flemish painters. He made the first great hit in 1830 by a large picture representing the 'Burgomaster Van der Werf of Leyden in the Spanish Siege.' Wappers surrounded himself with a number of young painters and under the enthusiasm he kindled a new school of Belgian painting came into existence. In 1832 he was appointed professor and eight years later director of the Art Academy of Antwerp; from 1846 to 1853 he was president of the Belgium National Museum and in 1847 was ennobled. Among his principal pictures are 'The People of Brussels Tearing up the Proclamation of Prince Frederick' (1835, in the Museum at Brussels); 'The Entombment' (1836, in Saint Michael's Church, Louvain); 'The Madonna in Clouds Surrounded by Angels'; 'Charles IX. Shooting Down the Huguenots'; 'Anne Boleyn Taking Leave of Elizabeth'; 'Boccaccio Reading His Decameron to Johanna of Aragon'; 'The Capture of Rhodes by the Turks,' etc.

Wappinger ("the east"), a confederacy of the Algonquian stock of North American Indians formerly occupying the territory extending eastward from Hudson River, between the neighborhood of Poughkeepsie and Manhattan Island in New York to the valley of Connecticut River in Connecticut. They were closely related to the Mohicans, and by most authorities

WAPPINGER FALLS— WAR AND PEACE

are regarded as having been a part of them. The component tribes of the Wappinger confederacy were: (1) the Wappinger, which formed the principal tribe and which occupied Dutchess County, N. Y., about Poughkeepsie and Wappinger Kill; (2) the Reggawawanks; (3) Wequaesgeeks; (4) Sintsinks; (5) Kitchawanks; (6) Tankiteks; (7) Nochpeems; (8) Siwanoy; (9) Sequins or Mattabesees. As Connecticut became colonized by the whites, the eastern tribes of the confederacy gradually sold their lands and almost dwindled away, the survivors finally joining the Indians at Scaticook, Conn., and Stockbridge, Mass., while a few went to Canada. The Hudson River tribes became involved in war with the Dutch colonists in 1640, which continued for five years, the Indians losing 1,600 of their number and the Wappingers being the chief sufferers. The survivors retained their tribal customs until 1756, and continued to occupy a tract in Westchester County, when most of them joined the Nanticokes, then living under Iroquois protection at Chenango, near Binghamton, N. Y., and finally became merged with the Delawares. Some of them also joined the Moravian and Stockbridge Indians, while a few still resided in Dutchess County just before the American Revolution.

Wappinger (wóp'in-jér) Falls, N. Y., village, Dutchess County; on Wappinger Creek, about two and one half miles from its mouth at New Hamburg, and seven miles south of Poughkeepsie. It is connected with Poughkeepsie by an electric line, and has the advantage of the steamer traffic on the Hudson. The river port used by the village is New Hamburg. The name of the village is that of a tribe of Indians who once inhabited this section. The creek here falls over a series of high ledges which form picturesque cascades, and also furnish water power for several manufactories. The chief industrial establishments are print-works, established in 1834; overall and sheeting factory, machine shop, grist mill, and creameries. The village has a union school, public and parish elementary schools, and a school library. There is one state bank, having deposits amounting to \$463,100. Pop. (1890) 3,718; (1900) 3,504; (1910) 3,195.

War. The last resort for the settlement of disputes is the appeal to physical force, whereby the weaker is either compelled to yield to the demands of the stronger, put to flight, or, in the last extremity, slain. War is resorted to either for advantage or for vengeance. The one party possesses something which the other has resolved to seize, or has inflicted some real or supposed injury on the other, which he determines to punish by the infliction of a corresponding chastisement. War and law are quite opposed to each other, but while opposed they are also related. The ultimate means of enforcing law is by physical force, but in every society the aim of law is to put down every appeal to force except on the part of the magistrate, and equally to restrict his use of it to the enforcement of the law. Where there is no organized society, every individual family, or group, enforces its own claims, and appeals to force are consequently frequent, but as society extends its organization these partial appeals to force are declared illegal and put down. But the society, however extended, is still partial; out-

side of it exist other societies with independent laws and different interests. Between these, disputes are liable to arise, which, failing mutual accommodation, can only be settled by force. In each society, moreover, the central authority is liable to vicissitudes of strength. When it is active and vigorous, the whole society is kept in equilibrium and repose; when it is weak or idle, private or party interests assert themselves, the laws are disobeyed and the central authority may be defied and overthrown. Thus, three conditions of warfare arise according to the degree of organization of society: the state of private war, when no great central authority has been established, or when it has been wholly destroyed, the state of civil war, when such an authority, having been established, has decayed, and the society arranges itself in different parties for the purpose of maintaining the old, or establishing a new central authority; and the state of international war, when states sufficiently powerful to control their own subjects quarrel among themselves. In each of these states war is continuous with and opposed to law.

The aim of law is always to control war, and either suppress it or render it subservient to its own enforcement or re-establishment; the aim of war is either to supplement the impotence of law, or accomplish some object forbidden by it. Hence the peculiarity of all laws relating to war. They are fluctuating in their nature, because the power to enforce them is frequently wanting; yet they are necessary, and in the end efficacious, because force can be applied in favor of law as well as against it, and it commonly becomes the interest of society in the long run so to apply it. It follows also from these conditions that as there are three states of warfare, so there are three relative states of law opposed to them: international law is opposed to international war, national law to civil war, and natural law to private war. In each case, law forms the boundary of war and war of law, so that where one is strong the other is weak. International law may thus be defined as consisting of those common principles which still continue to be recognized and observed by belligerents. The persistent disregard of any principle of law by a belligerent would annihilate it as a principle of international law, and as the belligerent has already set the power of its immediate antagonist at defiance, the only considerations which can enforce its observance of an international law are its own respect for its principle, or its fear of the power of neutrals. In like manner national law is opposed to and limits civil war. In as far as either party sets the national law at defiance the law is abrogated and can only be re-established by force; in as far as it is observed it controls the action of both parties. Private war is opposed by natural law because there is no positive law recognized by the parties. Violence is limited only by the power or conscience of the belligerents. See INTERNATIONAL LAW.

War and Peace, a novel by Count Lyof Tolstoi (1865-68). It deals with the stirring conflict between Napoleon and France, and Koutouzoff and Russia, and covers the period from 1805 to 1815. War is here treated not alone as a dramatic spectacle, but as a symbol of great social forces striving for expression.

WAR, CIVIL—WAR TARIFF

War, Civil. See UNITED STATES—CAUSES OF THE CIVIL WAR; MILITARY EVENTS OF THE CIVIL WAR; POLITICAL EVENTS OF THE CIVIL WAR; ETC.

War College. See ARMY WAR COLLEGE.

War Dance, among the American Indians, the name given a dance engaged in by the warriors of a tribe before a warlike expedition; a dance simulating a battle.

War Department, one of the executive divisions of the United States government, located at Washington, D. C. The department is under the supervision of a secretary of war, who is a member of the President's cabinet. The department has entire control of all matters relating to the equipment and discipline of the military forces of the United States, and is charged with the duty of carrying into effect all laws relative to the army and militia enacted by the Congress. The secretary's authority in military matters is second only to the President. The first secretary of war was Henry Knox of Massachusetts, whose term of office began with that of Washington. During the Civil War Edwin M. Stanton (q.v.) was the secretary of war. For a complete list of the successive secretaries of war see the article UNITED STATES—CABINET OFFICERS, ETC. See also ARMY OF THE UNITED STATES.

War-eagle, any eagle connected with war or the idea of war in symbolism or otherwise, as the imperial eagle (*Aquila mogolnik*) adopted as a standard first by a favorite legion and later by Roman troops generally; whence the symbol spread to the national insignia of many European countries. The war-eagle of the North American Indians, whose feathers ornamented their war-bonnets and other accoutrements, was the golden eagle (*A. chrysatus*). See EAGLE.

War God. Most ancient religions had their war gods, and in America, before the Spanish conquest, the Mexican war god was specially worshipped, with human sacrificial rites. Ares and Mars were the war gods of Greece and Rome respectively. The Jews evidently regarded Jehovah as presiding over their battles, and David is represented in 1 Samuel xvii. 45, as telling the Philistine that he comes "in the name of the Lord of hosts, the God of the armies of Israel." The same conception exists in some degree among Christians.

War Indemnity, the sum of money paid by the defeated country in an international war to the victorious government. The largest amount ever demanded in this way was \$1,000,000,000, which France was compelled to pay Germany after the war of 1870-71. In the war of 1866 Prussia took from Austria and her allies a war indemnity of \$41,750,000, besides \$3,750,000 requisition during the campaign. The war between Japan and China covered about nine months and the amount paid by the latter nation was \$185,000,000. For the Turko-Russian war of 1877, Russia demanded \$701,000,000, but her claim was reduced to \$160,000,000. Great Britain has received two indemnities from China, the first, in 1840, being \$25,000,000, and the second, in 1860, about \$10,000,000. The Sultan of Turkey was forced by the powers to reduce his claims of \$30,000,000 on Greece at the close of the war of 1877 to \$10,000,000. The settlement of war claims between the United States

and Spain at the end of the war of 1898 was unique. The American-Spanish War lasted four months, and cost the United States \$150,000,000. The Spaniards were defeated in every battle on sea and land, and finally sued for peace. A treaty was signed by President McKinley and by the Queen Regent of Spain in 1899 by the terms of which the United States relinquished all claims for indemnity of any kind, and agreed to send back to Spain, at its own cost, all Spanish soldiers taken prisoners, with their arms. The United States further agreed to pay to Spain the sum of \$20,000,000. On her part, Spain was to relinquish all claim of sovereignty over Cuba; to cede to the United States the island of Porto Rico, and other islands then under Spanish sovereignty in the West Indies; the island of Guam, in the Ladrões; and the archipelago known as the Philippine Islands. In this case it would appear that the victors paid for their success. At the close of the trouble between China and the powers, growing out of the Boxer uprising in 1900, it was agreed that China pay the powers 450,000,000 taels as an indemnity.

War Office, in Great Britain, the department of government which controls all matters connected with the army. The head of the department is the secretary of state for war. He has a seat in the cabinet, and a salary of \$25,000 a year is attached to his office. In the administration of the department he is assisted by a permanent under-secretary, who receives \$10,000 per annum; by a parliamentary under-secretary, a financial secretary, and other officials. The heads of the different army departments, both military and civil, are responsible to him. The commander-in-chief has command of all troops, and is responsible for their discipline and efficiency, he is the chief adviser of the secretary of state; has to prepare schemes of offense and defense, and recommends officers for promotion, appointments, and honors or rewards. The chief secretary alone is responsible to Parliament.

War of the Pacific, a name given to the war between Chile and Bolivia and Peru in 1879-83. See BOLIVIA; CHILE; PERU.

War Paint, among the American Indians, paint put on the face and other parts of the body on going to war, with the object of making their appearance more terrible to their enemies.

War Path, among the American Indians, the route or path taken on going to war; a warlike expedition or excursion. On the warpath, means on a hostile or warlike expedition; hence, colloquially, about to make an attack on an adversary or measure.

War, Prisoners of. See PRISONERS.

War, Prize of. See CONTRABAND; NEUTRALITY; PRIZE MONEY.

War of the Roses. See ENGLAND.

War, Rules of. See INTERNATIONAL LAW.

War Songs. See NATIONAL SONGS.

War Tariff, a general name applied to various tariff measures passed by Congress during the Civil War. These bills included a bill raising the tariff of 1857 about one-third, passed 2 March 1861; amended tariff act raising duties passed 5 Aug. 1861; act increasing tariff

on tea, coffee and sugar, passed 24 Dec. 1861; act raising tariff duties temporarily, passed 14 July 1862; act raising all duties 50 per cent for 90 days, passed 29 April 1864; general revision of tariff, increasing duties, passed 30 June 1864. See U. S.—TARIFF IN THE.

War Tokens. See **TOKEN MONEY.**

Warbeck, wār'bēk, Perkin, a pretender to the throne of England in the reign of Henry VII.: b. Tournay about 1475; d. London 28 Nov. 1499. He was the son of a Jew of Tournay and appears in history in 1499, when he was attached to the court of Margaret, dowager duchess of Burgundy. At this court he was taught to represent Richard, duke of York, younger brother of Edward V., one of the princes generally supposed to have been murdered by their uncle Richard of Gloster in the tower. In 1492, when there was prospect of a war between France and England, Warbeck landed at Cork, and was joined by numerous partisans. At the invitation of Charles VIII. he went to the court of France, where he was acknowledged as duke of York, received a pension, and was attended by a body guard. At the peace of Estaples he was dismissed from France and went to Flanders, where he was received by the duchess of Burgundy as her nephew. The belief in the truth of his claim was shared by the populace of England, and certain of the nobility, and some of them openly declared for him. He was, however, taken prisoner after an invasion of Cornwall 1497, tried for high treason and hanged at Tyburn.

Warblers, a popular name applied in different countries to a variety of small insectivorous birds belonging to quite distinct families, but resembling one another in habits and appearance. The American warblers, to which the book name "wood-warblers" is often given, belong to the extensive family *Mniotiltidae* and include a varied assemblage of generic types somewhat closely related to the tanagers (*Tamniptidae*). They are small birds, with one or two exceptions about five inches in length. Their colors are bright and varied, yellows often predominating, with patches of red, blue, brown, black or white in conspicuous places; but the females are often plain and often closely resemble one another in the different species. The bill varies, but is generally rather slender, pointed, slightly curved and without a hooked tip, a tooth, or a deep notch; the feet are rather small with scutellate tarsi and present no positive characters; the primary wing-quills are 9, the secondaries are not elongated and the tail-quills are 12 in number. Owing to the great diversity of the genera it is practically impossible to give any brief definition covering all. Various groupings of the genera into sub-families have been proposed, but with the exception of the well marked *Icterinae*, which are decidedly aberrant, they all intergrade more or less easily. A division such as follows, is convenient and fairly natural. The typical warblers (*Sylviolinae*) have the wings nearly always longer than the tail, the bill slender and conical, with the commissure slightly curved and the rictal bristles short or wanting. The fly-catching warblers or (*Setophaginae*) have similar wings and tail, with the bill broad and flattened at the base, the commissure slightly curved, and the

rictal bristles numerous and very long. The chats (*Icteriae*) have the wings shorter than the tail, the bill high, compressed and stout, with strongly curved commissure and no rictal bristles. They are much larger than any of the members of the other subfamilies.

There are, in round numbers, about 130 species of known warblers, strictly confined to America; the flycatching warblers being found in greatest variety and abundance in northern South America, Central America and the West Indies, while the *Sylviolinae* are pre-eminently characteristic of North America. Warblers are all insectivorous and migratory, chiefly inhabitants of the woods and thickets, and because of their varied habits and great abundance among the most interesting of our birds. They build on the ground, in bushes, in crevices or high up in tall trees, nests exhibiting a great diversity in material and architecture. The name warbler probably alludes to their constancy rather than to their ability as musicians, for their songs, though attractive and interesting, are, with a few exceptions, not highly melodious. The varied role played by warblers in nature has been well expressed by Dr. Coues in the following poetic passage: "The warblers have we always with us, all in their own good time; they come out of the South, pass on, return, and are away again, their appearance and withdrawal scarcely less than a mystery, many stay with us all summer long, and some brave the winters in our midst. Some of these slight creatures, guided by unerring instinct, travel true to the meridian in the hours of darkness, slipping past 'like a thief in the night,' stopping at daybreak from their lofty flights to rest and recruit for the next stage of the journey. Others pass more leisurely from tree to tree, in a ceaseless tide of migration, gleaming as they go; the hardier males, in full song and plumage, lead the way for the weaker females and yearlings. With tireless industry do the warblers befriend the human race; their unconscious zeal plays due part in the nice adjustment of Nature's forces, helping to bring about that balance of vegetable and insect life without which agriculture would be in vain. They visit the orchard when the apple and pear, the peach, plum and cherry are in bloom, seeming to revel carelessly amid the sweet-scented and deliciously tinted blossoms, but never faltering in their good work. They peer into the crevices of the bark, scrutinize each leaf, and explore the very heart of the buds, to detect, drag forth and destroy those tiny creatures, singly insignificant, collectively a scourge, which prey upon the hopes of the fruit-grower, and which, if undisturbed, would bring his care to naught. Some warblers flit incessantly in the terminal foliage of the tallest trees; others hug close to the scored trunks and gnarled boughs of the forest kings; some peep from the thicket, the coppice, the impenetrable mantle of shrubbery that decks tiny water courses, playing hide-and-seek with all comers; others, more humble still, descend to the ground, where they glide with pretty mincing steps and affected turning of the head this way and that, their delicate flesh-tinted feet just stirring the layer of withered leaves with which a past season carpeted the ground. We seek warblers everywhere in their season; we shall find them a continual surprise."

WARBLERS

Of the Sylvicolinae 9 genera and 46 species are North American, the principal genera being *Dendroica*, the largest by far, *Helminthophila* and *Geothlypis*. The diagnostic colors of many are sufficiently indicated by their vernacular names, which, however, are generally descriptive of the full-plumaged males only. The black and white creeping warbler (*Mniotilta varia*) has the sexes similarly colored and is a common migratory woodland species throughout eastern North America, breeding from Virginia northward and wintering from the Gulf coast into South America. In feeding habits it resembles the brown creeper rather than the other warblers, climbing the tree trunks and larger branches by clinging to the bark, searching the crevices for insects and their eggs, but not using the tail as a prop. The song is a feeble unmusical trill, but the call notes are varied. A simple nest on the ground of bark, moss, grass, etc., contains 4 or 5 eggs, white with profuse reddish brown spots. *Protonotaria* includes only *P. citrea*, the prothonotary warbler, a beautiful species whose prevailing color in both sexes is golden with olivaceous and bluish above and the tail-quills largely white; the bill is unusually long, acute and black. It breeds in most of the United States east of Nebraska, but is rare in the east north of Virginia. It haunts swampy woods and thickets and nests in holes of trees. An interesting species of striking aspect is the worm-eating warbler (*Helminthorus vermivorus*), with a stout acute bill without bristles, a very short tail and strong feet. In both sexes the back is olivaceous, the under parts buff, and the head conspicuously marked with four longitudinal black stripes. A common bird of the eastern United States west to Nebraska and north to southern New England, breeding over this range and wintering in the Antilles and northern South America. It is a bird of the woodland undergrowth and nests on the ground, the 4 or 5 eggs being brilliant white with fine dots of reddish brown. The popular name is a misnomer as it does not feed on worms but chiefly on caterpillars and spiders. The best known of the *Helminthophila* is the blue-winged yellow warbler (*H. pinus*) having about the limits of range of the last and much resembling it in habits though they are more active and arboreal and often frequent the shrubbery of parks and well-kept grounds. The Nashville warbler (*H. ruficapilla*) is a plain species; the males in breeding dress olive above, yellow below, the latter remaining even in the duller autumn colors and the female. Except in the extreme northern States this species is a migrant only, but very common in the United States, breeds in the British provinces and winters in Mexico and Central America. This genus also includes the golden-winged, Tennessee, and orange-crowned warblers of the eastern United States, and several western species, besides some rarities which are supposed to be hybrids. No warbler is better known than the little gaily-dressed parula or blue yellow-backed warbler (*Geothlypis americana*) which breeds in the United States and lower Canada west to the great plains and winters in the West Indies and Central America. They are very common in open woods during the migrations and distributed more locally in swampy districts and river valleys during the breeding

period, probably attracted by the abundance of the long stemmed *Usses* or "Spanish moss," of which their beautiful, usually globular hanging nests, are in chief part constructed. Like the *Dendroica* they are true tree-warblers, incessantly flitting about the outermost twigs, turning and hanging in every conceivable attitude and often taking short flights in pursuit of flying insects.

Dendroica comprises 24 species of the warblers found within our limits. Most of them glean for their food in the terminal twigs of trees much as does the parula, and like it their songs are simple feeble trills. They come in troops when the forest trees are bursting into leaf in May and most of them pass to the British provinces or at least to the northern woods and high mountain ridges to breed, but a few, like the yellow warbler, remain through the summer. With few exceptions they never nest on the ground. The males in breeding plumage are handsomely and variously colored, but nearly always have much white on the tail quills, the female, young and male autumn plumage is generally very different. One of the best-known but hardly a good representative example is the yellow or summer warbler (*D. aestiva*), one of the few species which has an extensive breeding range in the United States. It is abundant almost everywhere in North America and its warm glowing yellow color and the absence of white from the tail are diagnostic. It is less of a woodland bird than many of the others and frequents orchards, parks and roadside thickets, building a pretty nest, compactly felted of soft vegetable fibres, bits of wool, paper, etc., securely wedged in the upright fork of a bush or low tree. More than one brood of 4 or 5 young is sometimes raised and these birds often outwit the cowbird which drops an egg in their nests by covering the intruder with a false floor and hatching their own brood above it. The spring song of the yellow warbler is very sprightly. Other species which breed over considerable areas in the United States are the cerulean warbler (*D. cerulea*), chestnut-sided warbler (*D. pennsylvanica*), yellow-throated warbler (*D. dominica*), pine warbler (*D. vigorsii*), and prairie warbler (*D. discolor*) in the east, and the black-throated gray warbler (*D. nigrescens*), Townsend's warbler (*D. townsendi*), hermit warbler (*D. occidentalis*) and golden-cheeked warbler (*D. chrysoparia*) in the west. Well-known migrant species, which breed in Canada and more or less in our northern border States and along the high mountain ridge southward even to North Carolina and Georgia, are the Cape May warbler (*D. tigrina*), black-throated blue warbler (*D. caerulescens*), yellow-rumped or myrtle warbler (*D. coronata*), which lingers into the winter even in the latitude of Philadelphia, magnolia warbler (*D. maculosa*), bay-breasted warbler (*D. castanea*), the beautiful black and orange Blackburn's warbler (*D. blackburni*), black-throated green warbler (*D. virens*), and the eastern palm warbler (*D. palmarum hypochrysea*).

Very distinct in appearance from all of the above are the members of the genus *Seturus*, of ground-loving habits and thrush-like plumage, brownish above and streaked or spotted below. We have three species. The golden-crowned thrush or oven-bird (*S. auricapillus*) slightly exceeds six inches in length, and both sexes

WARBLERS

are of a rather bright olive color above, with a golden crown-streak bounded by black. It inhabits the greater part of North America and breeds from Virginia and Kansas northward, building its over-arched nest of leaves and grasses on the ground and laying therein 4 to 6 white eggs thickly speckled with brown and lilac. The oven-bird is very common in the summer in the New England and Middle States, inhabiting low damp woods and living mostly on or near the ground, searching for its chiefly insect food among the fallen leaves. Besides its ordinary loud clear whistled song, it has an exquisitely sweet nuptial song seldom heard. The common water-thrush or water-wagtail (*S. noveboracensis*) is slightly smaller and of a nearly uniform rich olive-brown above, pale yellow, streaked with brown below. Its breeding range is northerly in the eastern United States to Illinois, and to the Arctic, and it winters in middle America. The water-thrush inhabits woodlands in the vicinity of streams and swamps and resembles the wagtails in its habit of wading and raising the tail to balance the body on its insecure footing. The nest of leaves, grasses and fine roots is built on the ground in the shelter of a log and the crystalline white eggs profusely speckled with brown number 4 to 6. A related species of similar habits, the large-billed or Louisiana water-thrush (*S. motorilla*), is more southern in range but very similar in appearance. Both are exquisite songsters.

Geothlypis contains a group of ground-warblers with the feet stout and the wings generally very short and exceeded in length by the tail. A typical very common, and wide ranging species is the Maryland yellow-throat (*G. trichas*) which breeds from Georgia to Labrador. The male is a handsome bird, olive above, chiefly clear yellow below, the face with a broad rich black mask which the female lacks. It lives in thickets and shrubbery, especially where the ground is low and wet. The nest is skilfully concealed in tufts of herbage on the ground and is constructed of leaves, twigs, grass, rootlets, etc. The 4 to 6 eggs are white and rather sparingly spotted about the large end with brown. The song is a loud, clear, lively whistle sung with great energy. A related species is the Kentucky warbler (*G. formosa*), which differs in having in place of the black mask a black crown and a black bar running obliquely downward and backward from the eye and between them a yellow superciliary stripe. It is more southern than the yellow-throat, but breeds throughout the eastern United States. Much less common than the yellow-throat its habits are essentially similar, but it is a bird more of the woodland borders and underbrush than of the swampy thickets. Other species are the mourning warbler (*G. philadelphia*), the Connecticut warbler (*G. agilis*), and several southern and western species closely similar to the Maryland yellow-throat.

Coming now to the *Setophagina*, we find five genera and 10 species recorded as North American, six of which are Mexican and scarcely or not at all cross the borders of the United States. The remaining four are generally common eastern birds. Typical of the subfamily is the redstart (*Setophaga ruticilla*), not at all related to the redstart of Europe. The male is a handsome bird of lustrous black plumage, the belly white, and the wing lining,

a patch on the primaries and one on each side of the tail quills of rich orange which appears and disappears as the bird opens and closes these parts in its never ceasing activity in the pursuit of insects among the outer foliage of trees and the surrounding air. As a catcher of flying insects the redstart is very skilful; its song is lively and pleasing and its nest a neatly felted cup of soft vegetable fibres in an upright fork of a small tree. It is found throughout most of North America and breeds in the northern half of the United States and in Canada. The Canadian fly-catching warbler (*Sylvania canadensis*) is bluish ash above, rich yellow below, with numerous small black streaks on the crown and more distinct ones on the throat, and a black band running backward from the eye. This handsome species is found from the base of the Rocky Mountains eastward and breeds from southern New England and New York to Newfoundland. It is abundant during the migrations and spends much of its time making short flights to secure passing insects, from which it immediately returns to its unending activity in the higher branches of the trees. The nest is on the ground and the eggs of the usual warbler type. Two related species are the hooded warbler (*S. mitrata*) and the black-capped warbler (*S. pusilla*), both chiefly yellow, the first with a black cap and throat and a rich yellow face mask, the last smaller and with the black confined to the crown. The hooded warbler is chiefly southerly and hardly reaches the northern limits of the United States, but breeds southward to the Gulf coast, building its nest in low bushes. The black-cap, on the other hand, is even more northerly and has a wider western range than the Canadian warbler, but like it nests on the ground.

Of the *Icteriinae* our fauna contains but a single genus and species, the yellow-breasted chat (*Icteria virens*), isolated in structure and standing quite apart from the other warblers; and in manners equally unique. The length is about $7\frac{1}{4}$ inches, the color clear olive-green above; the throat, breast and sides bright rich yellow; the belly, superciliary and maxillary stripes and a spot below the eye, white; the cheeks and lores black, and the bill blue-black. The form is stout and the wings much shorter than the tail. In two subspecies the yellow-breasted chat inhabits the entire United States except the northern tier. It is locally abundant, living in tangled thickets on warm hillsides and sheltered valleys, and building a loose but pretty nest of leaves, plant stems, strips of bark and grass in the thickest patches of briars, often in association with many of its fellows. The eggs, which are about an inch long by four fifths of an inch in diameter, are usually 3 or 4 in number, variously spotted and blotched with brown and lilac. The chats are among the most remarkable of our songsters, but have no definite song, producing a constant succession of extraordinary sounds with much force and expression. Some are clear whistles endlessly modulated and combined, some are hoarse guttural notes, some sharp coughing sounds, some cat-like mews, some are original, others imitated, but all are uttered with a vehemence and abandon that is quite inimitable. Few birds surpass the chat in imitative or ventriloquistic powers and few combine their nuptial song, which is heard both

WARBLER — WARD

by night and day, with such a series of grotesque aerial antics.

The warblers of Europe belong to the family *Sylviidae*, related to the thrushes and by many ornithologists combined with these and other birds in the family *Turdidae* used in a wide sense. The *Sylviidae* have the bill of moderate length and slender form, broad at the base and tapering towards the extremity. The tip of the upper mandible is curved downwards, and is slightly notched. The wings are elongated with ten primaries and the tail has often only ten quills, the tarsi long and slender. The family includes a variety of sub-families and a large number of genera, presenting quite as varied an array of structures and habits as do the *Mniotiltidae* and quite as difficult to classify. All are small insectivorous and mostly plain-colored birds. They are especially characteristic of Eurasia, though some breed in Australia, New Zealand and the Polynesian Islands. *Regulus* and *Phylloscopus* inhabit North America. To this group belongs the genus *Sylvia*, represented by such forms as the white-throat (*Sylvia undata*), garden warbler (*S. hortensis*), chiff-chaff (*S. rufo*), and other equally notable species elsewhere described.

Besides an Asiatic species (*Phylloscopus borealis*) which extends its breeding range into Alaska the only North American representatives of this very extensive family are four species of *Regulus*, diminutive little birds known as kinglets (q.v.). The dainty little gnatcatchers (q.v.) of which three species are North American, and which with their allies form the family *Polioptilidae*, are very closely related to the *Sylviidae*. Some of the flycatching *Muscicapidae* are called warblers in Australia.

Consult: Baird, Brewer and Ridgway, 'North American Birds' (1874); Coues, 'Key to North American Birds' (Boston 1903); Ridgway, 'Birds of North and Middle America' (Washington 1902); Wilson, 'American Ornithology' (Philadelphia 1814); Jones, 'Songs of the Warblers' (Oberlin 1900); Dresser, 'Birds of Europe' (London 1881); Seebohm, 'Birds of British Museum (Sylviidae)', Vol. V. (London 1881); Sharpe, Id. Vol. X. (*Mniotiltidae*), (London 1885).

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University of Pennsylvania.

Warbler, in cattle. See-Ox-wor.

Warburton, wär'bér-tón, William, English prelate: b. Newark-upon-Trent, Nottinghamshire, 24 Dec. 1698; d. Gloucester 7 Jan. 1779. He studied law and practised in Newark, but soon gave up this profession and in 1723 took orders in the English Church, becoming rector of Brant Broughton, Lincolnshire, in 1728. In 1726 he formed an acquaintance with Theobald, to whose edition of Shakespeare he contributed. In 1727 he began to distinguish himself as an original writer by his inquiry into the 'Causes of Prodiges and Miracles,' and in 1736 appeared his 'Alliance between Church and State, or the Necessity and Equity of an Established Religion and Test Law.' The first volume of his chief work was published in 1737, entitled 'The Divine Legation of Moses demonstrated on the Principles of a Religious Deist from the Omission of the Doctrine of a Future State of Rewards and Punishments in the Jewish Dis-

pensation.' This paradoxical performance met with adversaries among all parties, who concurred in criticising and censuring the theory on which it is founded, and he replied to his critics in a vindication of his opinions. Having published in the journal called the 'Works of the Learned,' in 1739 and 1740, a defense of the 'Essay on Man' against the remarks of De Crousaz of Geneva, Pope acknowledged his obligations to Warburton, and an intimacy was established. On his death in 1744 Pope bequeathed to Warburton half his library, and the copyright of such of his works already printed as were not otherwise disposed of. In 1747 Warburton appeared as the editor of Shakespeare, and proved himself to be but a poor commentator. In 1750 appeared 'Julian, or a Discourse concerning the Earthquake and Fiery Eruption which defeated that Emperor's Attempt to rebuild the Temple, elicited by Middleton's Inquiry concerning the Miraculous Powers of the Christian Church.' In 1757 he became dean of Bristol, and two years after bishop of Gloucester. In 1768 he established a lecture at Lincoln's Inn on the evidence in favor of Christianity from the prophecies of the Old and New Testaments. His collected works were published by Hurd in 1788. Consult the biography of Watson (1863); and Mark Pattison, 'Essays' (1889).

Ward, wärd, Adolphus William, English historian: b. Hampstead 2 Dec. 1837. He was graduated from Peterhouse College, Cambridge, and became a fellow of his college. In 1866 he was appointed professor of history and English literature in Owens College, Manchester, an institution of which he was principal from 1888 till his resignation in 1897. He took a leading part in the movement for the foundation of Victoria University, and in 1900 became master of Peterhouse. He published a translation of Curtius' 'History of Greece' (1868-73), and in 1875 his valuable 'History of English Dramatic Literature to the Death of Queen Anne' appeared (new ed. 1899). Among his other works are: 'The House of Austria in the Thirty Years' War' (1869); 'Chaucer' (1880), and 'Dickens' (1882) in 'English Men of Letters' series; 'The Counter-Reformation' (1888); 'Sir Henry Wotton' (1897); 'Great Britain and Hanover' (1899); and numerous contributions to the 'Encyclopædia Britannica' and the 'Dictionary of National Biography.'

Ward, Artemas, American general: b. Shrewsbury, Mass., 1727; d. there 28 Oct. 1800. He was graduated at Harvard College in 1748; early entered public life as a representative to the general court; became a member of the executive council and a justice of the court of common pleas of Worcester County. In the French and Indian War he served as lieutenant-colonel under Abercrombie and at the opening of the Revolutionary War was in command of the besieging forces at Boston till the arrival of Washington, after which he was stationed with the right wing on Roxbury Heights. He resigned his commission of major-general, in April 1776, but at the request of Washington continued to serve till the end of May. He was president of the Massachusetts executive council in 1777, a member of the legislature for 16 years, and sat in Congress 1780-1 and 1791-2.

WARD

Ward, Artemus. See **BROWN, CHARLES FARRAR.**

Ward, Edgar Melville; b. Urbana, Ohio, 24 Feb. 1839. He was graduated at Miami University; proceeded to study art at the National Academy of New York 1870-1 and subsequently spent six years in France (1872-8). He is a favorite genre painter and among his pictures are: 'The Sabot Maker'; 'Brittany Wash-woman'; and 'The Quilting Party.' He has been a National Academician since 1883 and subsequently was elected professor in the National Academy.

Ward, Edward Matthew, English painter: b. Pimlico, London, 14 July 1816; d. Slough 15 Jan. 1879. His first studies were pursued in the studio of John Cawse, London, and in 1835 he entered the Royal Academy schools. During the three years 1836-9 he was in Paris, Venice and Rome; and studied fresco-painting with Cornelius at Munich. His first noteworthy picture was 'Cimabue and Giotto,' exhibited at the Royal Academy (1839). From that time he was a regular contributor to the Academy's annual exhibition, and in 1855 was elected academician. In 1853 he was commissioned to paint eight pictures for the corridor of the House of Commons, their subjects being: 'The Execution of Montrose'; 'The Last Sleep of Argyll'; 'Alice Lisle concealing Fugitives'; 'Monk declaring for a Free Parliament'; 'The Escape of Charles II. with Jane Lane'; 'The Landing of Charles II.'; 'The Acquittal of the Seven Bishops'; and 'William and Mary receiving the Lords and Commons.' He died from the effects of a self-inflicted wound. His numerous oil paintings were historical and genre, and among the best of them are: 'Dr. Johnson reading the Manuscript of the Vicar of Wakefield' (1843); 'A Scene from the Early Life of Goldsmith' (1844); 'A Scene in Lord Chesterfield's Ante-room in 1748' (1845), now in the Tate Gallery; 'Charles II. and Nell Gwyn' (1848), in the South Kensington Museum; 'The Royal Family of France in the Temple' (1851); 'Charlotte Corday going to Execution' (1852); the 'Ante-chamber at Whitehall during the Dying Moments of Charles II.' (1861); 'Hogarth's Studio, 1739' (1863); 'Luther's First Study of the Bible' (1869), now owned by the British and Foreign Bible Society; 'The Eve of Saint Bartholomew' (1873); 'Marie Antoinette in the Conciergerie' (1874); etc. Many of these are well known in engravings. Consult: Dafforne, 'Life and Works of E. W. Ward' (1879).

Ward, Elizabeth Stuart Phelps, American novelist and poet, daughter of Austin Phelps (q. v.): b. Andover, Mass., 31 Aug. 1844; d. Newton, Mass., 28 Jan. 1910. In 1868 she was married to H. D. Ward (q. v.), with whom she has sometimes collaborated. Her first work to attract attention was 'The Gates Ajar' (1868), which had a very wide reading and was instrumental in substituting reasonable healthy views concerning a future existence in place of the vague and conventional ideas on the subject then prevalent in religious circles. Among her later works being: 'Men, Women, and Ghosts' (1869); 'The Silent Partner' (1870); 'Hedged in' (1870); 'The Story of Avis' (1877); 'Beyond the Gates' (1883); 'Dr. Zay' (1884); 'The Gates Between' (1887); 'Poetic Studies,' verse (1875); 'Songs of the

Silent World' (1884); 'The Struggle for Immortality' (1889), a volume of essays; 'A Singular Life' (1895); 'The Story of Jesus Christ' (1897). Her work is marked by originality as well as intensity of feeling and strength of moral purpose, but the note sounded is sometimes too shrill for the occasion.

Ward, Henry Augustus, American naturalist: b. Rochester, N. Y., 9 March 1834; d. Buffalo, N. Y., 4 July 1906. He was educated at Williams College, and at the Lawrence Scientific School at Harvard, where he was assistant to Prof. Agassiz. He studied in Paris and traveled through Europe and the Orient in 1855-9; occupied the chair of natural sciences at Rochester University in 1860-5, and in 1866-9 was manager of gold mines in Montana and South Carolina. He was engaged in traveling in various countries of the world in 1870-1900, collecting cabinets of mineralogy and geology, which he distributed among the colleges and universities of the United States. He founded at Rochester Ward's Natural Science Establishment, was naturalist to the United States expedition to Santo Domingo in 1871, and published 'Notices of the Megatherium Cuvieri'; and 'Description of the Most Celebrated Fossil Animals in the Royal Museum of Europe.'

Ward, Herbert Dickinson, American author, son of W. H. Ward (q. v.): b. Waltham, Mass., 30 June 1861. He was graduated from Amherst and in 1888 was married to Elizabeth Stuart Phelps (q. v.) with whom he wrote 'The Master of the Magicians' (1890); and 'Come Forth' (1890). Among works of which he is sole author are 'The New Senior at Andover'; 'The Burglar who Moved Paradise' (1897); 'The White Crown and Other Stories' (1894).

Ward, Mrs. Humphry. See **WARD, MARY AUGUSTA ARNOLD.**

Ward, James, English artist: b. London 23 Oct. 1769; d. Cheshunt, Hertfordshire, 23 Nov. 1859. He studied the engraver's art in his boyhood and also early turned his attention to painting, in which he was a pupil of Morland who married his sister. He was elected R.A. in 1811. His first painting was exhibited in 1790, and from that time to his death he produced numerous pictures of different types, though his best work was done in the painting of animals. His most important works are: 'Bull-baiting' (1797); The 'Alderney Bull, Cow, and Calf in a Meadow' (1820-2), his masterpiece, now in the National Gallery, painted in rivalry with Paul Potter's celebrated picture; 'Allegory of Waterloo' (1817), a sketch for the British Institution which he afterward painted larger with less success; 'Gordale Scar, Yorkshire,' in the National Gallery (this great picture with its noble group of cattle which was presented by Lord Ribblesdale to the British Museum with a view to its transference to the British Museum was rolled up and consigned to a cellar until 1858, though it eventually reached its destination in 1878); 'Harlech Castle,' also in the National Gallery; 'Regent's Park in 1807'; 'A Cattle Piece,' also in the National Gallery; 'Bulls Fighting in a Landscape,' a work of great merit, now in the South Kensington Museum; 'Donkey and Pigs,' also in the museum at South Kensington; 'Pigs,' and 'A Chinese Sow,' in the same collection;

WARD

'The Council of Herten,' in the Manchester Gallery; and 'De Tabley Park,' in the Oldham Gallery. Among his engravings the most noteworthy are after Rembrandt, Hoppner, Rubens, Northcote, Morland, and Reynolds. As an engraver he was not less successful than as a painter and a complete set of impressions of all his plates, in their different states, 300 in all, was presented by him to the British Museum before his death.

Ward, John Henry Hobart, American soldier: b. New York 17 June 1823; d. Monroe, N. Y., 25 July 1903. He entered the United States army in 1841, was appointed sergeant-major in 1845, served through the Mexican War, and was afterward successively assistant commissary-general and commissary-general of New York. He organized a regiment of volunteers at the outbreak of the Civil War, was appointed colonel, and was engaged at the first battle of Bull Run. He later participated in the Peninsular campaign, in the second battle of Bull Run, and on 4 Oct. 1862 was promoted brigadier-general of volunteers. He was subsequently engaged with the Army of the Potomac and was in command of a brigade at Fredericksburg, Chancellorsville, Gettysburg, the Wilderness, Spottsylvania, and other important battles. He was honorably mustered out of service 21 July 1864 and from 1870 until his death was clerk of the superior court of New York city.

Ward, John Quincy Adams, American sculptor: b. Urbana, Ohio, 20 June 1830. In 1850 he entered the studio of Henry K. Browne, where he studied six years. In 1861 he opened a studio in New York, where as the fruits of his residence in the Indian country, he modeled his 'Indian Hunter.' This was followed by 'The Good Samaritan,' 'Commodore M. C. Perry,' with reliefs and 'The Freedman.' Among his best known work in later years he produced the 'Citizen Soldier,' and statues of 'Shakespeare,' 'General Reynolds,' 'General Washington,' 'General Israel Putnam,' 'General Thomas,' 'General Daniel Morgan' and 'Lafayette.' He subsequently modeled the colossal statue of 'Washington' for the New York sub-treasury building, a colossal statue of 'President Garfield' and 'The Pilgrim.' The crowning group of 'Victory' in the arch for the Dewey reception in New York in 1899 was also his work. For three years he was vice-president, and for one term president of the National Academy of Design, and was trustee of the Metropolitan Museum of Art. Died: May, 1910.

Ward, Lester Frank, American geologist: b. Joliet, Ill., 18 June 1841. Graduated from Columbian University in 1869, he was assistant-geologist in the United States geological survey in 1881-8, and geologist in 1888. He made especial investigations in the field of paleobotany. Among his publications are: 'Guide to the Flora of Washington and Vicinity' (1881); 'Sketch of Paleobotany' (1885); 'Types of the Laramie Flora' (1887); 'Geographical Distribution of Fossil Plants' (1888); 'Outlines of Sociology' (1898); and 'Pure Sociology' (1903).

Ward, Lydia Avery Coonley, American writer: b. Lynchburg, Va., 31 Jan. 1845. She was married in 1869 to J. E. Coonley (d. 1882)

and in 1897 to H. A. Ward, and was president of the Chicago Woman's Club 1895-6. She has published 'Under the Pines and Other Verses' (1895); 'Our Flag,' a cantata, with music by G. F. Root (1896); 'Singing Verses for Children' (1897); 'Love Songs' (1898).

Ward, Mary Augusta Arnold, English novelist: b. Hobart, Tasmania, 11 June 1851. She is a daughter of Thomas Arnold (q.v.), second son of Dr. Thomas Arnold of Rugby and in 1872 was married to Thomas Humphry Ward. Her father, having become a Roman Catholic, gave up his educational post in Tasmania and returned to England in 1856 and there his daughter was educated. The father held appointments at Dublin and Birmingham, and after 1885 resided at Oxford, where she also lived with her husband till they removed to London in 1880. Her long residence in Oxford and consequent familiarity with the intellectual atmosphere of the university no doubt gave her that inclination toward ethical discussion which has so markedly influenced the character of her writing. In 1890 she was one of the principal founders of University Hall, a settlement among the poor in the Saint Pancras district of London, and since 1897 occupying a spacious building near Tavistock Square, erected for that purpose by Passmore Edwards. In the work of this settlement Mrs. Ward has put a vast amount of personal endeavor and thought, and its influence has been commensurate with the pains that have been taken in its behalf. Mrs. Ward's first important literary work was a translation of 'Amiel's Journal' (1885), but prior to this she had published 'Milly and Olly,' a child's story. These were followed by 'Miss Bretherton,' a story (1886); and 'Robert Elsmere' (1888), which brought her almost immediately a world wide fame, being translated into several languages, and having an immense sale. Later works of hers are 'The History of David Grieve' (1892); 'Marcella' (1894); 'Sir George Tressady' (1896); 'Helbeck of Bannisdale' (1898); 'Eleanor' (1900); 'Lady Rose's Daughter' (1902); 'The Marriage of William Ashe' (1905); 'Fenwick's Career' (1906). She has also published 'Unitarianism and the Future' (1894). All of Mrs. Ward's novels display much intellectual power and intensity of moral purpose, and her influence upon the social and ethical thought of the last 10 or 15 years in England and the United States has not been inconsiderable. Her novels are of varying degrees of excellence, 'Helbeck of Bannisdale' being perhaps the most powerfully conceived since 'Robert Elsmere.'

Ward, May Alden, American writer and lecturer: b. Cincinnati, Ohio, 1853. She was graduated from the Ohio Wesleyan University in 1873 and in 1873 was married to W. G. Ward (b. 1848) (q.v.). She has been president of the Massachusetts State Federation of Woman's Clubs from 1901, has lectured widely and is the author of 'Life of Dante' (1887); 'Petrarch: His Life and Works' (1891); 'Old Colony Days' (1896); 'Prophets of the 19th Century' (1900).

Ward, Nathaniel, English Puritan divine: b. Haverhill, Suffolk, 1576; d. Shenfield, Essex, 1652. He was educated at Emmanuel College, Cambridge, traveled widely on the Continent, took orders in 1618, and from 1620 to 1624

appears to have been chaplain to the colony of British merchants at Elbing, Prussia. On his return to England, he was curate of Saint James', Piccadilly (1626-8), and subsequently rector of Standon Massey, Essex. On account of his Puritan views he was frequently cited before Laud, who finally (1633) deprived him of the living. He emigrated in 1634 to Massachusetts, and became minister to a settlement at Agawam, later called Ipswich. This post, because of ill-health, he resigned in 1636. In 1639 he was appointed, with the Rev. John Cotton (q.v.), to frame the first code of laws for the colony,—the 'Body of Liberties,' passed by the general court in 1641. This compilation is in many respects a remarkable one, and displays wide knowledge of law. Ward was influential in the colonial government; in 1645 he became a member of the committee for the revision of the Massachusetts laws. But he is chiefly known as the author of the 'most eccentric and amusing' work written in colonial America. This book, 'The Simple Cobbler of Agawam,' was printed at London in 1647, and passed through four editions in that year. It appeared under the pseudonym of Theodore de la Guard—Theodore being the Greek equivalent of the Hebrew Nathaniel, de la Guard the French for Ward—who turns from his humble last to satirize England old and new. Amid some curious syntax, there is in it an abundance of eloquence and wit, making it still very readable. There is, too, much of the intolerance of the place and time. Ward went back to England in 1646. His 'Cobbler' had gained him some notice, and he preached before the Commons in 1647 and received the living of Shenfield, Essex, in 1648. Among his further publications were the sermon above noted (1647); 'A Religious Retreat Sounded to a Religious Army' (1647); 'To the High and Honorable Parliament, Humble Petitions, Serious Suggestions, and Dutiful Expostulations' (1650); and probably, 'Mercurius Anit-mechanicus' (1648), denouncing the execution of Charles. Consult: Dean, 'Memoir of Nathaniel Ward' (1868); Tyler, 'A History of American Literature' (1878); the 'Collection of the Massachusetts Historical Society, 3d ser., I, VIII; 4th ser. VII.

Ward, Susan Hayes, American author, sister of W. H. Ward (q.v.): b. Abington, Mass., 26 Nov. 1838. She was educated at Wheaton Seminary, Mass., under Lucy Larcom (q.v.), studied art in New York, Boston, Dresden, and Paris, and later studied at the Woman's Medical College in Boston. She afterward engaged in lecturing on art; was art-critic on the New York 'Independent' in 1883-93; and office editor in 1892-8. Her writings include: 'Christ at the Door' (1872); 'Sabrina Hackett'; 'History of the Broadway Tabernacle' (1901); 'George Hepworth,' a biography (1903); etc.

Ward, Thomas Humphry, English author and journalist: b. Hull 9 Nov. 1845. He was educated at Oxford, and was married to Mary Augusta Arnold, since widely known as Mrs. Humphry Ward, in 1872. He edited 'Ward's English Poets' (1881-2); 'English Art in the Public Galleries of London' (1888); 'The Reign of Queen Victoria' (1887); 'Men of the Reign' (1885); 'Men of the Time' 12th ed.

Ward, Wilfrid Philip, English author, son of W. G. Ward (q.v.): b. Ware, Hertfordshire, 2 Jan. 1856. He was educated at Ushaw College, Durham; and the Gregorian University at Rome, and was lecturer at the former in 1890. He has been a member of the Council of the Catholic Union of Great Britain since 1886, and has published 'The Wish to Believe' (1884); 'The Clothes of Religion' (1886); 'William George Ward and the Oxford Movement' (1889); 'William George Ward and the Catholic Revival' (1893); 'Witnesses to the Unseen' (1894); 'Life and Times of Cardinal Wiseman' (1897).

Ward, William, English Baptist missionary: b. Derby 20 Oct. 1769; d. Serampore, India, 7 March 1823. He was a printer who was licensed as a preacher and going to India in 1799 settled at Serampore. Besides printing various religious works in the Bengali language, he wrote 'An Account of the Writings, Religion and Manners of the Hindoos including Translation from their Principal Works' (1811, 5th ed. 1863), which was long the principal authority upon Indian affairs.

Ward, William G., American educator: b. Sandusky, Ohio, 5 Nov. 1848. He was graduated at Ohio Wesleyan University in 1872, studied theology at Drew Theological Seminary, was president of Spokane College in 1890-2, and professor of English literature at Syracuse University 1893-8. In the last named year he became professor of English literature at the Emerson College of Oratory, Boston, Mass. He has published 'Tennyson's Debt to Environment' (1898); 'The Poetry of Robert Browning' (1898); 'Art for Schools' (1899); 'Studies in Literature' (1901).

Ward, William George, English Tractarian leader and Roman Catholic theologian: b. London 21 March 1812; d. Hampstead, London, 6 July 1882. Educated at Winchester College, he entered Christ Church, Oxford, in 1830, obtained a scholarship at Lincoln College in 1833, was graduated in 1834, and about the same time secured election to a fellowship at Balliol. He then took orders, and was a lecturer in mathematics and logic. He soon became a powerful influence in Oxford life, especially on its religious side, among those more or less affected by him being Archbishop Tait, Benjamin Jowett, Dean Stanley, and the poet Clough. He in turn was profoundly influenced by John Henry Newman, whose famous 'Tract 90' he defended in two pamphlets. The publication, in 1843, of William Palmer's 'Narrative of Events connected with the Publication of Tracts for the Times' produced from Ward in reply his famous work 'The Ideal of a Christian Church considered in comparison with existing Practice' (1844), and the formal condemnation of this book by the university authorities precipitated Ward's reception into the Roman Catholic Church (1845), where he was soon followed by Newman and other Tractarians. In 1851 he became lecturer in moral philosophy in Saint Edmund's College, Ware, and in 1854 the pope gave him the diploma of Ph.D. He resigned his lectureship in 1858, and in the 'Dublin Review,' which he edited 1863-78, contended vigorously on behalf of ultramontane principles. He was founder and leading member of the

Metaphysical Society (1869) which included such opposites as Huxley and Martineau. In addition to the works already mentioned Ward wrote: 'On Nature and Grace' (1860); 'Essays on the Philosophy of Theism' (1884), a work of great ability; and many smaller works. Consult: 'William George Ward and the Oxford Movement' (1889); and 'W. G. Ward and the Catholic Revival' (1893), both by his son Wilfrid. See OXFORD MOVEMENT.

Ward, William Hayes, American Congregational clergyman and Orientalist: b. Abington, Mass., 25 June 1835. He was graduated from Amherst in 1856, from the Theological Seminary there in 1859, and was ordained to the ministry in the last named year. He engaged in pastoral work and in teaching, and in 1860-8 he was pastor of the Congregational Church and professor of Latin at Ripon College. He joined the editorial staff of the New York 'Independent' in 1868 and since 1870 has been editor of that publication. He was in charge of the Wolfe exploring expedition to Babylonia in 1884, concerning which he published a 'Report' (1885); and has also written: 'World's Christmas Hymn' with his sister, S. H. Ward (1883); 'Biography of Sidney Lanier' (1885); etc.

Ward, wård, Frederick, American actor: b. Wardington, Oxfordshire, England, 23 Feb. 1851. He made his first stage appearance in 1867, acted in English cities until 1874, then came to the United States, and for three years was leading man at Booth's Theatre, New York. He afterward supported Edwin Booth and John McCullough, and since 1881 has starred as a tragedian, also lecturing often on Shakespearean and other subjects.

Warden, David Adams, American musician: b. London 1815; d. Philadelphia, Pa., 4 Feb. 1902. He came to the United States before the Civil War and was engaged as organist in various Episcopal churches. During the Civil War period he composed the music for many patriotic songs, among which were 'The Flag's Come Back to Tennessee' and 'All Quiet Along the Potomac.' Both words and music of 'Mother, Don't Weep for Your Boy' and 'Tell Me, Ye Winged Winds' were his and he was also author of a book of chants.

Warden, David Baillie, American scholar: b. Ireland 1788; d. Paris, France, 8 Oct. 1845. He came to the United States when very young, received a classical education, was graduated from the New York Medical College; and in 1804 he was appointed secretary of the United States legation at Paris. He subsequently became consul and continued in that office until his death. His 'Statistical, Political, and Historical Account of the United States of North America' (3 vols. 1819) was later published in both French and German, and his other writings include: 'Inquiry concerning the Intellectual and Moral Faculties and Literature of the Negroes' (1810); 'Recherches sur les antiquités de l'Amérique septentrionale' (1827); 'L'Art de vérifier les dates, chronologie historique de l'Amérique' (10 vols. 1826-44); 'Bibliotheca Americana' (1831); etc.

Warden, Florence. See JAMES, FLORENCE.

Warden, the title in the United States of certain public officers, such as game-wardens,

who enforce the game laws, port-wardens, who are harbor officers, and the wardens of prisons.

In the Protestant Episcopal Church the church-wardens are two parochial officers, chosen annually at the Easter vestries, one by the minister, and one by the parishioners. Their duties are to protect the church-building and its appurtenances, to superintend the ceremonies of divine worship, and generally to act as the legal representatives of the parish.

In England the heads of All Souls, Keble, Merton, Wadham, and New colleges at Oxford are known as wardens. The Lord Warden of the Cinque Ports is an official with merely nominal duties now, though he was formerly of much importance. Lord Wardens of the Marches were formerly appointed to keep the disturbed border counties of England in a state of defense against the Scotch.

Wardha, wūr'dā, or Wurdha, India, (1) the chief town of the district of the same name, Central Provinces, on the left bank of the Wardha River, 40 miles southwest of Nagpur and 471 east of Bombay. It was founded in 1866; as a junction station on the railway it has become a centre of the cotton trade. (2) The district, which was formed out of Nagpur in 1862, has an area of 2,401 square miles. The staple crops are millet, cotton, wheat, and rice. Here is produced the well-known Hinganghat cotton, which is exported to the amount of 25,000 bales a year. The breed of cattle is good, especially the trotting bullocks. A railway crosses the centre of the district. (3) The Wardha River rises in the Satpura hills, and flows southeast for 254 miles to join the Weingunga; the united stream, under the name of the Pranhita, ultimately falls into the Godavary at Sironcha.

Wardian Cases are boxes covered with tight-fitting frames of glass, under which plants are successfully raised that could not be grown in the vitiated atmosphere of some cities or dwellings. They were invented by N. B. Ward, a surgeon of London, in 1836. Plants have been successfully transported long distances packed in these cases.

Wardlaw, Elizabeth, Lady, Scottish poet: b. 1677; d. 1727. She was the daughter of Sir Charles Halkett, of Pittfirrane, and in 1696 married Sir Henry Wardlaw, of Pitreavie, near Dunfermline. Her ballad, 'Hardyknute, a Fragment,' was first published in 1719 as an antique, and after enlargement from 216 to 336 lines, had been several times reprinted, when Percy in the second edition of his 'Reliques,' revealed its authorship. To Lady Wardlaw has also been ascribed, 'Sir Patrick Spens,' 'The Douglas Tragedy,' and many more traditional Scotch ballads. This is highly improbable. 'Hardyknute,' says Sir Walter Scott, "was the first poem I ever learnt, the last I shall ever forget."

Wardlaw, Ralph, Scottish Congregational clergyman: b. Dalkeith 22 Dec. 1779; d. near Glasgow 17 Dec. 1853. He at first studied divinity with the view of becoming a minister of the Associate Secession Church, but having been led to change his views on the subject of ecclesiastical polity, he was settled in charge of a congregation in Glasgow, where he continued to officiate to the close of his life.

WARD'S ISLAND — WARE

In 1811 he was appointed professor of systematic theology in the Congregational seminary in Glasgow. Both as a lecturer and as a preacher his abilities were of the first order. Of his numerous publications may be cited: 'Discourses on the Socinian Controversy' (1814); 'Essays on Assurance of Faith, and Extent of the Atonement and Universal Pardon' (1830); 'Christian Ethics' (1832); 'National Church Establishments Examined' (1839); 'Lectures on Female Prostitution' (1842); 'Congregational Independency' (1847).

Ward's Island, an island in East River, lying northeast of the Borough of Manhattan, New York city, and forming the northern boundary of Hell Gate. It is roughly circular in shape, and includes about 200 acres. It is the property of the city of New York, and contains a State Insane Asylum, a home for invalid soldiers, a home for children, and the State Emigrant Hospital.

Ware, wär, Henry, American Unitarian divine: b. Sherburne, Mass., 1 April 1764; d. Cambridge, Mass., 12 July 1845. He was graduated at Harvard in 1785, for two years studied theology, and in 1787 became pastor of the First Church at Hingham, Mass., where he remained until 1805, and then accepted the Hollis professorship of divinity at Harvard. At this time Unitarian views were beginning to cause dissension in the New England churches, and the appointment of Ware, a leader of Unitarian thought, to this position in the college brought on a memorable controversy, in which he took a prominent part, particularly in his 'Letters Addressed to Trinitarians and Calvinists' (1820), in answer to the 'Letters to Unitarians' by Leonard Woods, a professor at the Andover Theological Seminary. Ware also published 'An Answer to Dr. Woods' Reply' (1822); 'A Postscript to an Answer,' etc. (1823); 'Foundation, Evidences, and Truth of Religion' (1842); and other writings. He resigned his professorship in 1840, but was at the head of the Harvard Divinity School from its establishment in 1826 until his death.

Ware, Henry, Jr., American Unitarian divine and author, son of Henry Ware (q.v.): b. at Hingham, Mass., 21 April 1794; d. Framingham, Mass., 22 Sept. 1843. He was graduated at Harvard in 1812; was instructor at Phillips Exeter Academy, 1812-14; studied theology at Harvard under his father, and in 1817 became minister of the Second Church, Boston. From 1830 to 1842 he was professor of pulpit eloquence and pastoral care in the Harvard Divinity School, and in 1819-22 was one of the editors of the 'Christian Disciple,' afterward the 'Christian Examiner,' an organ of Unitarian thought. He took an active part in the organization of the Unitarian movement. Among his writings are: 'Hints on Extemporaneous Preaching' (1824); 'On the Formation of the Christian Character' (1831); 'Life of the Saviour' (1832); 'Scenes and Characters Illustrating Christian Truth' (1837); various memoirs; and compositions in verse.

Ware, William, American Unitarian clergyman and author: b. Hingham, Mass., 3 Aug. 1797; d. Cambridge, Mass., 19 Feb. 1852. He was graduated at Harvard in 1816, studied theology under his father, Henry Ware (q.v.) at

Cambridge, held pastorates at Northboro, Mass., Brooklyn, Conn., and Burlington, Vt., and from 1821 to 1836 was minister of the First Unitarian Church, New York. He afterward preached for short periods at several other places, all near Boston, was proprietor and editor of the 'Christian Examiner' (1839-44), and published: 'Letters from Palmyra' (1837), first published in the 'Knickerbocker Magazine,' subsequently republished as 'Zenobia, or the Fall of Palmyra' (new ed. 1868); 'Probus, or Rome in the 3d Century' (1838), republished as 'Aurelian' (new ed. 1868); 'Julian, or Scenes in Judea' (1841); 'Sketches of European Capitals' (1851); 'Lectures on the Works and Genius of Washington Allston' (1852); and a 'Life of Nathaniel Bacon,' in Sparks' series. He edited 'American Unitarian Biography' (1850).

Ware, William Robert, American architect, son of Henry Ware, Jr. (q.v.): b. Cambridge, Mass., 27 May 1834. He was graduated at Harvard (1852) and at the Lawrence Scientific School (1856). He practised architecture at Boston (1860-81). In 1865 he was appointed professor of architecture in the Massachusetts Institute of Technology and since 1881 has filled the same chair in Columbia University. Among his writings are 'Modern Perspective': 'The American Vignola.'

Ware, Mass., town in Hampshire County; on the Ware River, and on the Boston & M., and the Boston & A. R.R.'s; nearly in the centre of the State, about 25 miles northeast of Springfield, and about the same distance west of Worcester. It was settled in 1673 by Jabez Olmstead, and on 25 Nov. 1761 was incorporated as a precinct, and in 1775 was made a town. The town has a general elevation of about 550 feet above sea-level. The waterworks are owned and operated by the town. The chief manufacturing establishments are cotton, woolen, and hosiery factories, shoe factories, and machine shops. The government census of 1900 gives the number of manufacturing establishments 100; the number of employees in manufactories, 2,777; the amount of wages paid annually, \$779,930; the total cost for material used during the year \$2,119,178; and the value of the products \$3,681,069. From 1900 to 1904 there has been considerable increase of industrial interests and the number of employees are now (1904) about 3,500. The surrounding farms and the nearby manufacturing villages contribute to Ware's industrial prosperity. There are seven churches, a public high school, established in 1850, public and parish graded schools, and a public library which contains about 12,000 volumes. There is one national and one savings bank; the national bank is capitalized for \$300,000 and has deposits amounting to \$321,730. The savings bank, a State institution, has deposits amounting to \$4,009,350 (1 Jan. 1904). The government is administered by means of town meetings, at which, by popular vote, the town officers are elected. Nearly one third the population are of foreign birth, chiefly French Canadians and Poles. Pop. (1890) 7,329; (1900) 8,263; (1910) 8,774. Consult Gay, 'Gazetteer of Hampshire County.'

R. E. CARVER,
Editor 'Ware River News'

WAREHAM—WARFIELD

Wareham, wăr'am, Mass. town in Plymouth County; on Buzzard's Bay, and on the New York, New Haven & Hartford Railroad; about 30 miles southeast of Boston and 15 miles northeast of New Bedford. It has steamer connections with many of the coast cities and towns. The town contains the villages of Wareham, East Wareham, West Wareham, South Wareham, and Onset. The chief industries are iron manufacturing, and the cultivation of cranberries. The town has five churches, one high school, elementary schools public and private, and a public library. There are two banks, one national, capitalized for \$100,000, and a savings bank with deposits amounting to \$878,470. Pop. (1890) 3451; (1900) 3432, (1910) 4102.

Warehouseman, in law, one who receives goods of any kind for the mere purpose of storage. He is a bailee, and, his contract with the owner being one for their mutual benefit, is held only to ordinary care and diligence; and if loss or injury happen to the goods, he is not responsible without the absence of this care or diligence on his part, unless he expressly assumes a greater responsibility. There is nothing, however, to prevent warehousemen receiving goods on whatever terms or contract they see fit to make with the owner. Persons may become warehousemen, and subject only to the law of that relation, whose general position is quite different. Forwarding merchants in the United States are generally regarded as warehousemen, unless they take upon themselves the duty and the responsibility of common carriers, which they do when they begin to act in that character. On the other hand, common carriers, as railroad companies or expressmen, lie only under the less responsibility of warehousemen when they cease to be carriers of the goods they have transported, or have not yet begun to carry those they have taken for future transport. It is sometimes difficult to draw the line in particular cases, and any whether a person or company is liable without fault because the goods were then in his or its possession as carrier, or liable only for fault because the transit had not begun, or had terminated. The general principle is quite certain, although the authorities are far from uniform in their application of it. If the carrier receives them to carry at once or as soon as he can, he holds them as carrier; if he is to keep them until a distant period of transit, until then he is only a warehouseman. If the actual transit have ceased, some courts hold that his liability ceases at once; and it undoubtedly does so when, after he is ready to deliver them, they are left on his hands and he awaits the call of the owner or consignee. A warehouseman has a lien on goods in his care for the storage of them. He may deliver a part and retain his lien on the residue for all his charge for all the goods, if all were delivered to him as one bailment. But he has no general lien on any goods for all demands against the owner, or for the storage of other goods.

Warehousing System, the system by which goods liable to excise or customs duty are kept in warehouses without the duty being paid on them till they pass to the consumer or the retail dealer. Goods liable to duty are warehoused in a bonded warehouse, and are called goods in bond. The ports at which par-

ticular kinds of goods may be warehoused are determined; but the system has been gradually relaxed so as to admit of every important port being used for warehousing, and even important inland towns are admitted as warehousing centres. The warehouse is kept by a bonded store-keeper, who gives a bond of sufficient value, and with satisfactory security to the government for the performance of his duties. When goods are warehoused by an importer in a bonded store they may be transferred by an order, addressed by the importer to the store-keeper, to any other person, the new owner assuming the responsibilities of the importer. Goods in a bonded store are always open to the inspection of the officers of customs, and can only be inspected by the owner in the presence of the proper officer. Any importer who fraudulently gains access to goods stored by him without the presence of the proper officer is liable to a penalty of \$500. Goods must be stored and remain in store in their original packages, unless when permission is given before or after storing to sort or repack them. Any infringement of this regulation, or of the regulations for storing or removing goods, subjects to heavy penalties, commonly to the forfeiture of the goods. Goods under bond may on application be removed at the expense of the owner as often as required from one warehouse to another, or by coast, or inland carriage, from one port to another, being stored on the same terms in the new port or warehouse as in the old. The warehouse-keeper is bound to store the goods so that easy access can be had to each package. The keeper of the warehouse is liable for the duty on any goods taken out of the warehouse without proper authority; but if goods are improperly removed by a customs-officer no duty is exigible. Goods which have been in warehouse for five years must be re-warehoused, or they will be liable to be sold.

Warfield, wăr'fēld, Benjamin Breckenridge, American educator: b. Lexington, Ky., 5 Nov. 1851. He was graduated from Princeton in 1871, from the Princeton Theological Seminary in 1876, and studied at the University of Leipzig in 1877. The next year he became instructor in New Testament literature and exegesis at the Western Theological Seminary, Allegheny, Pa. He was appointed professor of those branches in 1879, and in 1887 he resigned to accept the chair of didactic and polemical theology at Princeton, which he still occupies. He edited the 'Presbyterian and Reformed Review' in 1890-1902, and has written: 'The Divine Origin of the Bible' (1882); 'Augustine's Anti-Pelagian Treatise' (1887); 'The Right of Systematic Theology' (1897); 'Acts and Pastoral Epistles' (1902); 'The Power of God, Unto Salvation' (1903); etc. He is prominent as a conservative leader in his denomination.

Warfield, Ethelbert Dudley, American college president, brother of B. B. Warfield (q.v.): b. Lexington, Ky., 16 March 1861. He was graduated from Princeton in 1882 and from the Columbia Law School in 1885. In 1885-8 he was engaged in law practice at Lexington, but in 1888 accepted the chair of history and the presidency of Miami University, Oxford, Ohio, resigning in 1891 to accept a like position at Lafayette College, Easton, Pa., where he

WARHAM — WARM-BLOODED ANIMALS

still remains. He was ordained to the Presbyterian ministry in 1899 and has published: 'The Kentucky Resolutions of 1798' (1887); 'At the Evening Hour' (1898); 'Memoir of Joseph Cabell Breckenridge, U. S. N.' (1898); etc.

Warham, wâr'am, William, English prelate, archbishop of Canterbury: b. Hampshire about 1450; d. 23 Aug. 1532. He was educated at New College, Oxford, of which he became a fellow in 1475. He acted for a time as advocate in the Court of Arches and moderator of the civil law school at Oxford, and in 1493 was ordained subdeacon. He was granted the living of Barley, Herts, in 1495, and that of Cottenham, near Cambridge, in 1500, and held both till 1502, when he was consecrated bishop of London. He was formally installed as archbishop of Canterbury in 1504, and about the same time he was appointed lord-chancellor after 17 months' service as keeper of the great seal. From 1506 till his death he was chancellor of Oxford University. He performed the ceremony of coronation in 1509, after the accession of Henry VIII., and in 1515 was succeeded by Wolsey in the lord-chancellorship. When Wolsey had been raised to the dignity of papal legate there was much friction between him and Warham in their official capacities. Warham's action in regard to the divorce question was weak and subservient, but shortly before his death he made a protest against the acts of the parliament undermining the papal authority. In his earlier years he was much employed on foreign embassies. Consult: Campbell, 'Lives of the Lord-Chancellors' (1845-6); Hook, 'Lives of the Archbishops of Canterbury,' new series, Vol. I. (1868).

Waring, wâr'ing, George Edwin, American sanitary engineer: b. Poundridge, N. Y., 1 July 1833; d. New York 29 Oct. 1898. He was a pupil in agriculture of James J. Mapes, in 1853-5 lectured in Vermont and Maine on improved farming methods, and in 1855 was made by Horace Greeley manager of the latter's well-known experimental farm at Chappaqua, N. Y. In 1857-61 he was agricultural and drainage engineer of Central Park, New York, whose drainage system he planned. Having entered the Federal army in 1861 as major of the 39th New York volunteers (Garibaldi Hussars), he fought at the first Bull Run, was transferred to the Department of the Southwest, recruited a battalion of cavalry (Fremont Hussars) at St. Louis, and when these were consolidated with other troops to form the 4th Missouri cavalry, he was made colonel of that regiment. He served as such until mustered out of the service in 1865. In 1867-77 he was manager of the Ogden Farm, Newport, R. I., writing during that time the 'Ogden Farm Papers' for the 'American Agriculturist.' At the time of the yellow-fever epidemic in Memphis, Tenn., in 1878, he was appointed to alter the drainage system there; and subsequently he devoted himself to sanitary engineering. In 1882 he was appointed a member of the National Board of Health, with which he remained connected for several years; and in 1894 he became assistant-engineer of New Orleans. From 1895 to 1898 he was street-cleaning commissioner of New York; during his administration he thoroughly reorganized his department and brought it to a high state of efficiency. In 1898 he was

selected to be head of a commission for the improvement of sanitary conditions in Havana, Cuba, with the purpose of eradicating yellow fever. He prepared a detailed report of great value, but died of the fever not long after his return to the United States. He was a member of the Institution of Civil Engineers, Great Britain, fellow of the Sanitary Institute of Great Britain, honorary member of the Royal Institute of Engineers, Holland, and corresponding member of the American Institute of Architects. Among his published works are: 'The Elements of Agriculture' (1854); 'Whip and Spur' (1875); 'A Farmer's Vacation' (1876); 'Village Improvements and Farm Villages' (1877); 'Sewerage and Land Drainage' (1889); and 'Modern Methods of Sewage Disposal' (1894).

Wark, David, Canadian legislator: b. near Londonderry, Ireland, 19 Feb. 1804; d. Fredericton, N. B., 20 Aug. 1903. In 1825 he emigrated to New Brunswick, there took up shipbuilding, bookkeeping, and teaching until 1836, turned to mercantile life at Richibucto, later adding to his interests milling and lumber-trade. He held office as a county magistrate and judge of the court of common pleas, in 1842 was elected from the county (Kent) to the provincial legislature, and in 1846 re-elected. From 1851 to 1867 he was a representative of the county in the legislative council, being in 1858-62 in the executive council, and for a time holding the post of receiver-general. In 1867 he was one of the original senators appointed to the Senate of Canada under the British North America act. Throughout his political career he was identified with the Liberal party. In the development of agriculture, the extension of trade, and the promotion of education, he was prominently concerned. He undertook in 1847 the furtherance of legislation favoring reciprocal trade between the provinces, and such legislation eventually proved of influence in connection with the reciprocity treaty of 1854 between Canada and the United States. The perfected system of the New Brunswick savings bank was largely due to his initiative; and he was chiefly instrumental in bringing about the movement which in 1847 resulted in the constitution of the provincial board of education of New Brunswick, with the attendant changes, and in the reorganization of King's College as the University of New Brunswick (1859). His centenary was formally observed in 1904 by the presentation of addresses, it being claimed for him that he was the world's oldest legislator; and on 28 April a portrait of him by W. Forbes, A.R.C.A., was unveiled in the Senate. Consult an article by Crockett in the 'Westminster Magazine' (Toronto) for June 1903.

Warkamoo'wee, in Ceylon, the name of a canoe used with outriggers. It is generally manned by four or five Lascars, who sit grouped together for hours at the end of the lever, adding or taking away a man according to the strength of the wind. These canoes often sail 10 miles an hour.

Warm-blooded Animals, the name given to mammals and birds, in contradistinction to fishes, amphibians, and reptiles, and to all invertebrate animals. See ANIMAL HEAT.

WARMAN—WARNER

Warman, Cy, American journalist: b. Greenup, Ill., 22 June 1855. He engaged as a farmer and wheat broker in Illinois until 1880 when he removed to Colorado. He became editor of the 'Western Railway,' Denver, Colo., in 1888; of the Creede, Colo., 'Chronicle' in 1892; and in 1892 was introduced to the public as the 'Poet of the Rockies' by the New York Sun. He went to New York in 1893 and has since been engaged in literary work. He wrote the words of the popular song 'Sweet Marie' and has published: 'Tales of an Engineer' (1895); 'Snow on the Headlight' (1899); 'Short Rails' (1900); a volume of verse; etc.

Warming and Ventilation. See HEATING AND VENTILATION.

War'moth, Henry Clay, American politician and soldier: b. McLeansboro, Ill., 9 May 1842. He was admitted to the bar in 1861 and became district attorney of the 18th judicial district of Missouri in 1862, but resigned to enter the Union army. He was appointed lieutenant-colonel, was engaged in the assaults on Vicksburg of 19-22 May 1862, and was present at the battles of Lookout Mountain and Missionary Ridge. He served in the Texan campaign and was afterward judge of the military court of the Department of the Gulf until the close of the war. He became military governor of Louisiana in 1868 and was inaugurated civil governor upon the adoption of its new constitution, an office he occupied until 1873. He was a member of the Louisiana legislature in 1876-7 and collector of customs at New Orleans in 1889-93. He was one of the builders of the New Orleans, Fort Jackson & Grand Isle Railroad, of which he is president.

Warner, wār'nēr, Anna Bartlett ('AMY LOTHPROP'), American novelist, sister of Susan Warner (q.v.): b. New York 1820. She collaborated with her sister in writing the novels: 'Say and Seal' (1860); 'Wych Hazel' (1876); and 'The Gold of Chickaree' (1876). Her own publications include: 'Dollars and Cents' (2 vols., 1853); 'My Brother's Keeper' (1855); 'Stories of Vinegar Hill' (1871); 'The Fourth Watch' (1874); 'The Light of the Morning' (1882); 'Cross Corners' (1887); etc.

Warner, Beverley Ellison, American Protestant Episcopal clergyman: b. Jersey City, N. J., 14 Oct. 1855. He was educated at Princeton and Trinity colleges and at Berkeley Divinity School, Middletown, Conn., took orders in 1879, and is now rector of Trinity Church, New Orleans, La. He is author of 'Troubled Waters,' a novel (1885); and has also written: 'English History in Shakespeare's Plays' (1894); 'The Young Man in Modern Life' (1902); etc.

Warner, Charles Dudley, American editor and author: b. Plainfield, Hampshire County, Mass., 12 Sept. 1829; d. Hartford, Conn., 20 Oct. 1900. Graduated from Hamilton College in 1851 and from the law school of the University of Pennsylvania in 1856, he was admitted to the bar in the latter year at Philadelphia, and practised his profession at Chicago in 1856-60. In 1860 he became assistant editor of the Hartford (Conn.) *Evening Press*, and in 1861 its editor-in-chief. This newspaper was consolidated in 1867 with the *Courant*, a morning journal, and Warner was a part-owner and long

assistant editor of the latter, though eventually his connection with the paper was largely that of a literary contributor. Some letters of travel in America and Europe in 1868-9, printed in the *Courant*, were widely copied, and his articles published in book-form in 1870 as 'My Summer in a Garden,' placed him high in the list of American humorists. From 1884 to 1892 he was in charge of the 'Editor's Drawer' department of 'Harper's Magazine,' and in 1892 was transferred to that of the 'Editor's Study' in the same magazine. He was particularly successful in the essay, in which he combined shrewd observation and cultured humor in a manner in many ways resembling that of Washington Irving. He was a discerning critic as well; and in addition to his literary activities was identified with various philanthropic work. His further publications include: 'A Book of Eloquence' (1853); 'Saunterings' (1872); 'Backlog Studies' (1872); 'The Gilded Age' (with S. L. Clemens, 1873); 'Baddeck, and That Sort of Thing' (1874); 'Mummies and Moslems' (1876—reissued as 'My Winter on the Nile'); 'In the Levant' (1877); 'Being a Boy' (1877); 'In the Wilderness' (1878); 'The American Newspaper' (1879); 'Studies of Irving' (with W. C. Bryant and George P. Putnam, 1880); 'Life of Washington Irving' (1881); 'Captain John Smith, Sometime Governor of Virginia, and Admiral of New England: A Study of His Life and Writings' (1881); 'A Roundabout Journey' (1883); 'Papers on Penology' (with others, 1886); 'Their Pilgrimage' (1886); 'On Horseback: A Tour in Virginia, North Carolina, and Tennessee, Published with Notes of Travel in Mexico and California' (1888); 'Studies in the South and West, with Comments on Canada' (1889); 'A Little Journey in the World: A Novel' (1889); 'Looking Forward: The Dual Government Realized' (1890); 'Our Italy, Southern California' (1890); 'As We Were Saying' (1891); 'Washington Irving' (1892); 'The Work of Washington Irving' (1893); 'As We Go' (1893); 'The Golden House: A Novel' (1894); 'The Relation of Literature to Life' (1896); 'The People for Whom Shakespeare Wrote' (1897). He also edited the 'American Men of Letters' series and 'A Library of the World's Best Literature' (1896-8).

Warner, Olin Levi, American sculptor: b. Suffield, Conn., 9 April 1844; d. New York 14 Aug. 1896. He studied in the Ecole des Beaux Arts in Paris and subsequently entered Carpeaux's studio. In 1872 he opened a studio in New York, where his work came under the eye of several critics whose commendation secured his success. In 1877-8 he modeled 'Twilight,' which established his reputation. Among other well known works of his may be mentioned 'The Dancing Nymph'; 'Cupid and Psyche'; reliefs of Joseph and other Indian chiefs; statues of Governor Buckingham of Connecticut, William Lloyd Garrison, General Devens, etc.

Warner, Seth, American soldier: b. Roxbury, Conn., 17 May 1743; d. there 26 Dec. 1784. Having removed in 1763 to Bennington, he was prominent in the dispute between New York and the 'New Hampshire Grants' (afterward Vermont), and was outlawed (1771) with Ethan Allen (q.v.) and others. He took part

in the capture of Ticonderoga, and 12 May 1775 effected the surrender of Crown Point with its garrison and 113 cannon. On 16 Sept. 1775 he was made by Montgomery, in whose Canadian expedition he participated, colonel of a regiment of Green Mountain rangers, though the provincial congress of New York withheld his commission. On 5 July 1776 he was commissioned by Congress the colonel of a regiment formed in pursuance of a resolution passed on that day; and on 7 July 1777 was defeated by Fraser at the battle of Hubbardton (q.v.). At the battle of Bennington, 16 Aug. 1777, he arrived with his regiment in time to meet the enemy's reinforcement and secure a victory. In 1782 he withdrew from the service. Consult Chipman, 'The Life of Col. Seth Warner, with an Account of the Controversy between New York and Vermont from 1763 to 1775' (1858).

Warner, Susan, American author: b. New York 11 July 1819; d. Highland Falls, Orange County, N. Y., 17 March 1885. For a number of years she resided on Constitution Island in the Hudson River, opposite West Point. Her first essay in literature was a novel entitled 'The Wide, Wide World,' published in 1850 under the pseudonym of Elizabeth Wetherell. This book was in its day next to 'Uncle Tom's Cabin' the most successful work of fiction in America in point of sales, and was popular also in Europe. In cheaper editions it still finds readers. It was mediocre in style and unduly pietistic in its manner; and, says Richardson, "all literature cannot show so lachrymose a book." It was succeeded by 'Queechy' (1852), which had also a large circulation, and 'The Hills of the Shatemuc' (1856), containing many glimpses of American scenery. She was also the author of 'The Law and the Testimony' (1853), in which the texts proving the great doctrines of Christianity are brought together under their appropriate heads; 'The Old Helmet' (1863); 'Melbourne House' (1864), and other works.

Warning Coloration, in zoology. See COLORATION, PROTECTIVE.

Warora, or Wurora, India, a town in the district of Chanda, Central Provinces, on the left bank of the Wardha River, 46 miles southeast of Wardha. Here is one of the largest coal fields in the peninsula. A shaft passes through a coal seam 15½ feet thick at a depth of 176 feet, and a little lower through another seam 11 feet thick. The field is estimated to afford an output of 100,000 tons per annum for 100 years. A narrow gauge line connects Warora with Wardha station on the Great Indian Peninsula Railway.

Warp. See WEAVING.

Warping, in agriculture, a mode of fertilizing poor or barren land by means of artificial inundation from rivers which hold large quantities of earthy matter, or warp, in suspension. The operation, which consists in enclosing a body or sheet of water till the warp has deposited, can only be carried out on flat low-lying tracts which may be readily submerged.

Warrant, as a legal term, is used to denote various judicial writings which authorize officers of the court to act in aid of justice such as to make arrests, search or seizures, and has been defined as "an order in writing in the name

of the people signed by a magistrate commanding the arrest of the defendant." The power is conferred upon justices of the peace, judges, of certain courts, and corporation officers who are clothed with powers of justice of the peace. The warrant is addressed to a sheriff, constable, or other officer, commanding him to arrest the body of the person named and bring him before the magistrate or court to answer or be examined regarding some offense which he is charged with having committed; it is not issued without probable cause, and is secured on the complaint of a person who thinks that a public offense has been committed and who appears before the justice of the peace and requests that a warrant be issued. A warrant must give the name of the accused or sufficient data to establish his identity. It must state the offense in respect to which the magistrate has authority to issue the warrant. A return must be made by the officer of his doing under it, but as there is no set time for a return, a warrant remains in force until it is executed. There are various other forms of warrant, such as search warrant of commitment, death warrant, extradition warrant, dividend or interest warrant, land warrant, landlord's warrant, tax warrant, warrant in bankruptcy, and municipal warrants.

Warrant Officer, a rank in the navy divided into three classes—gunners, boatswains, and carpenters, the gunners taking precedence of the other two. Formerly, before ironclads superseded wooden ships, there was only one officer of this rank of each class carried on board even the largest ships. Now, in addition to the officer of each class appointed to carry out the special duties of gunner, boatswain, and carpenter on board every ship, there are usually three or four junior gunners or boatswains appointed to battleships and some of the larger of other classes of ships to perform what are called quarter-deck duties, in addition to which in many of the larger ships an extra gunner or boatswain is appointed for torpedo duties. See NAVY OF THE UNITED STATES.

War'ranty, as a legal term is used as a promise or covenant or an undertaking on the part of one person to answer for the statements made of the thing warranted to be as represented, and to indemnify against loss, in case of failure. There are two general classes, express and implied. An express warranty is one made expressly in given terms, such as, in insurance, to indicate that an undertaking on the part of the insured that certain alleged facts are as he represents them to be; in real estate, that the grantor has a legal title to the lands conveyed; in sales, that the seller assures the quality, or the title to the property sold. A warranty in a sale of personal property is a statement made at the time of, and as part of the sale, that the goods or article sold is as represented. A warranty is implied when the law derives it by implication or inference from the nature of the transaction. No particular form of words is necessary to create a warranty. It is the subject matter of a statement and the circumstances under which it is made that are considered rather than the form.

A warranty is not valid unless supported by a consideration. In case of a breach of warranty the vendee may sue for the purchase price

WARREN

or may claim damages, and is not bound to return the goods. Proof of a warranty in a written contract must be shown in writing. Oral warranty cannot be admitted as evidence to vary the terms of a written contract except where the warranty is an independent agreement and where the writing does not embrace the whole contract.

Warren, wôr'ên, Sir Charles, British general: b. Bangor 7 Feb. 1840. He received a military education at Sandhurst and Woolwich, joined the Royal Engineers in 1857, and in 1861-5 was engaged in a survey of Gibraltar. During the three years following 1867 he carried out exploring work in Palestine for the Palestine Exploration Fund, and in 1876 was a commissioner for settling the western boundary of the Orange Free State. He commanded the Diamond Fields Horse in the Kaffir war of 1878, and during the immediately succeeding Griqua and Bechuana campaigns was commander of the field force. He returned to England in 1880, and during the next four years was attached to the Chatham school of military engineering as instructor in surveying. He commanded the Bechuanaland expedition of 1884-5, and was in command at Suakim. From 1886 till his resignation in 1888 he was chief commissioner of the metropolitan police of London, and for five years from 1889 was in command of the troops in the Straits Settlements, with the temporary rank of major-general. He was commander of the Thames district 1895-8; commanded a division in the South African war of 1899-1902, and co-operated with Sir Redvers Buller in that attempt to relieve Ladysmith with which the occupation of Spion Kop is prominently associated. He was afterward appointed military governor of Griqualand West. He has published 'Underground Jerusalem' (1876); 'The Temple or the Tomb' (1880); and, with C. R. Conder, 'Jerusalem' (1884).

Warren, Francis Emroy, American legislator: b. Hinsdale, Mass., 20 June 1844. He served in the Civil War as a non-commissioned officer in 1862-5 and received a Congressional medal for gallant conduct at Fort Hudson. He removed to Wyoming in 1868, became active in politics, was a member and president of the council, mayor of Cheyenne, treasurer of the Territory, and in 1885-6 was governor. In 1889 he again became governor and upon Wyoming's admission to statehood in 1890 was elected first governor of the State; before the expiration of his term, however, he was elected to the United States Senate, and has been re-elected 1894, 1900, and 1907.

Warren, Frederick Morris, American philologist: b. Durham, Maine, 9 July 1839. He was graduated from Amherst in 1860 and engaged as instructor in modern languages at Johns Hopkins in 1886-91. In 1891-1901 he was professor of Romance languages at the Western Reserve University, and since 1901 has been professor of modern languages at Yale. He has published: 'A Primer of French Literature' (1889); 'History of the Novel Previous to the Seventeenth Century' (1895), etc.; and has also edited: 'Selections from Victor Hugo' (1893); 'French Prose of the Seventeenth Century' (1899); Lamartine's 'Graziella' (1900); and 'Racine' (1903); etc.

Warren, Gouverneur Kemble, American military officer: b. Cold Spring, N. Y., 8 Jan. 1830; d. Newport, R. I., 8 Aug. 1882. He was graduated from West Point in 1850, was assigned to the engineering corps, and until 1859 was engaged in making river and railway surveys between the Mississippi River and the Pacific Ocean. He was assistant professor of mathematics at West Point from 1859-61, when he became lieutenant-colonel and later colonel and captain of volunteers. For service at Gaines' Mills in 1862 he was promoted brigadier-general, and he became chief of topographical engineers in 1863, rising to chief of engineers in the Army of the Potomac in that year. He was on the staff of Gen. Meade at the battle of Gettysburg, where on 2 July he seized and held Little Round Top, the key to the Federal position. He was promoted major-general of volunteers in May 1863 and in 1864 assumed command of the Fifth corps in the Army of the Potomac. He was subsequently placed in command of the Department of the Mississippi and in 1865 was mustered out of the volunteer service as brevet brigadier-general of regulars. He continued in the army, engaged in various surveys, and in 1879 was promoted lieutenant-colonel. A statue was unveiled to his memory on Little Round Top, Gettysburg, 8 Aug. 1882. He published various reports and 'An Account of the 5th Army Corps at Five Forks' (1866).

Warren, Henry Kimball, American college president: b. Cresco, Iowa, 31 May 1858. He was graduated from Olivet College in 1882, was principal of the public schools of Mount Pleasant, Mich., 1882-3, and of those at Hannibal, Mo., 1883-9. He was president of Gates College, Nebraska, 1899-04, of Salt Lake College, Utah, 1894-5, and has been president of Yankton College, South Dakota, from 1895.

Warren, Henry White, American Methodist bishop: b. Williamsburg, Mass., 4 Jan. 1831. He was graduated from Wesleyan University in 1853 and in 1855 was admitted into the Methodist Conference. He was engaged for 15 years in various pastorates in Massachusetts; served in the Massachusetts house of representatives in 1861-2; was pastor of the Arch Street Church in Philadelphia in 1871-4, and in 1877-80, and in 1880 was elected bishop. He has traveled in almost all parts of the United States in the performance of his episcopal duties and visited Japan for inspecting the Methodist Church missions in 1888. He edited 'The Study' in 1896-1900, and has published: 'Sights and Insights' (1874); 'Recreations in Astronomy' (1879); 'The Bible in the World's Education' (1892); 'Among the Forces' (1898); etc.

Warren, James, American Revolutionary leader: b. Plymouth, Mass., 28 Sept. 1726; d. there 27 Nov. 1808. He was graduated at Harvard in 1745, and for several years was engaged in mercantile pursuits at Plymouth. He was elected a member of the general court from Plymouth in 1766, was uniform in his support of the rights of the colonies, and remained in that assembly until it was dissolved in 1774. In 1772 he took a leading part in the establishment of committees of correspondence for the different colonies, a measure generally adopted. He became president of the Massa-

WARREN

Massachusetts provincial congress in 1775, was paymaster to the Continental army while it was at Cambridge, after the adoption of the Massachusetts State constitution was for several years speaker of the House, and held also a seat in the navy board.

Warren, Sir John Borlase, English naval officer: b. Stapleford, Nottinghamshire, 1754; d. Greenwich 27 Feb. 1822. He entered the navy as midshipman and after serving in that capacity for some time studied at Emanuel College, Cambridge, and took his degree in 1776. In 1774 he entered parliament as member for Marlow, and in 1775 was created a baronet. In 1793, on the commencement of the war with France, he was appointed to the *Flora* frigate, and in 1795 commanded the expedition to Quiberon Bay to assist the insurrectionists of La Vendée, which was unsuccessful. On 11 Oct. 1798 he fell in with a French squadron off the coast of Ireland destined for the invasion of that country, and captured the *Hoche* line-of-battle ship and three frigates. For this he was subsequently made rear-admiral of the blue. He continued in the navy until the peace of Amiens, when he was made privy councillor and sent to Russia as ambassador extraordinary and minister plenipotentiary, and there managed some delicate negotiations with regard to the retention of Malta with great ability. On his return he again entered into service, subsequently became vice-admiral, and in 1812 received the chief command in North America and the West Indies. He is the supposed author of an anonymous work entitled '*A View of the Naval Force of Great Britain*' (8 vols., 1791).

Warren, John Byrne Leicester, 3d BARON DE TABLEY, English poet: b. Tabley House, Cheshire, 26 April 1835; d. Ryde, Isle of Wight, 22 Nov. 1895. He was educated at Eton and Oxford, was called to the bar, and after a short diplomatic experience, devoted himself to literature. His life was passed in retirement, although he was the personal friend of Tennyson, Browning, Gladstone, and other eminent men of his day. His poetry, which reveals many excellencies of style as well as depth of thought, appeals to the cultivated few, but not to the general public. His earliest work appeared with the signature "G. F. Preston" (1858-62), and later he used the pseudonym "William Lancaster." After 1873 his work appeared with his own name, John Leicester Warren. In 1893 he published '*Poems Dramatic and Lyrical by Lord De Tabley*,' which met with qualified success, and in 1895 a second series appeared. Among his other volumes of verse are '*Præterita*' (1870); '*Philoctetes*' (1867); '*Orestes*' (1868); '*Rehearsals*' (1870); and '*Searching the Net*' (1873). He also wrote two novels, '*A Screw Loose*' (1868); '*Ropes of Sand*' (1869).

Warren, Joseph, American patriot: b. Roxbury, Mass., 11 June 1741; d. Charlestown, Mass., 17 June 1775. He was graduated from Harvard in 1759, studied medicine with Dr. James Lloyd of Boston, entered the practice of his profession in 1764, and from the time of the Stamp Act (q.v.) (1765) contributed to the press. On the occasion of the Townshend revenue acts (see TOWNSHEND, CHARLES, 1725-67), imposing duties on paper, glass, painter's colors,

and tea, legalizing writs of assistance, and forming a board of customs, Warren printed in the Boston '*Gazette*' over the signature "A True Patriot," a letter which caused Governor Francis Bernard to attempt the prosecution of the publishers on the ground that the article tended to bring the royal government into contempt. The attorney-general began proceedings, but the grand-jury refused to find a bill. In 1770 Warren was one of the committee of safety appointed after the "Boston massacre" of 5 March, and in 1772 he pronounced the memorial oration at the anniversary of that event. With Samuel Adams (q.v.) and James Otis (q.v.) he was recorded in November 1772 as a member of the first committee of correspondence, and during the next two years busily co-operated with Adams. When the latter left Boston, 10 Aug. 1774, to attend the meeting of the Continental Congress at Philadelphia, Warren became the leading figure in Massachusetts political movements. When the towns of Suffolk County assembled in convention at Milton, 9 Sept. 1774, Warren read a set of resolutions, drawn up by himself and since known as the "Suffolk resolves," which declared that a king who has violated the chartered rights of subjects forfeits their allegiance; that the "Regulating act," which had deprived Massachusetts without a previous notice and without a hearing of most important rights and liberties, was null and void; and directed tax-collectors to refuse to pay the moneys collected to Gates' treasurer, warned Gates that if patriots were arrested for political reasons royal officers would be held as hostages, and counseled the towns to choose their own officers of militia. After the meeting of the Provincial Congress in October 1774, Warren was chairman of the committee of safety for collecting military stores and organizing a militia, and on 5 March 1775 delivered his second oration on the anniversary of the "massacre." He was unanimously elected president of the Provincial Congress at its Watertown meeting, 31 May, being thus made chief executive under the provisional government. On 14 June he was chosen second major-general of Massachusetts forces, and on 17 June went to Bunker (Breed's) Hill, where he told Putnam and Prescott that he had come to serve as a volunteer aide. At the final conflict near Prescott's redoubt he was shot and killed. Webster's apostrophe to him in the 'Bunker Hill Oration' as "the first great martyr in this great cause" is well known. The biography by Everett in Sparks' '*American Biography*,' Vol. X. (1838) has been superseded by that of Frothingham, '*Life and Times of Joseph Warren*' (1865).

Warren, Mercy Otis, American patriot: b. Barnstable, Mass., 25 Sept. 1728; d. Plymouth, Mass., 19 Oct. 1814. She was Mrs. James Warren (see WARREN, JAMES), and James Otis (q.v.) was a brother. An ardent patriot, she corresponded with the leaders of the Revolution, among them Samuel and John Adams, and Thomas Jefferson. She wrote some dramatic works which were included in her volume of '*Poems, Dramatic and Miscellaneous*' (1790). Of these attempts in drama the best is the metrical 'Group,' satirizing British and Tory leaders. The chief of her writings, however, is the three-volume '*History of the Rise, Progress, and Termination of the*

WARREN

American Revolution, *Interspersed with Biographical, Political, and Moral Observations* (1805). Tyler admits the "tone of undisguised partisanship ringing through the book," but calls it a "powerful delineation of a great period," and says its character-sketches may still be found of interest.

Warren, Richard Henry, American musician: b. Albany, N. Y., 17 Sept. 1859. He studied under his father and others in this country, and then (1880 and 1886) in Europe. In 1877-9 he was organist and director of music at the church of Saint John the Evangelist, New York, and in the same city has held similar positions at the Reformed Episcopal Church (1879-80), All Souls' (Author Memorial) Church (1880-6), and Saint Bartholomew's Church (since 1886). In 1889-96 and again in 1904 he was conductor of the Church Choral Society, during the same time conducting other organizations. Besides many church anthems and services, songs, etc., his compositions include 'Igala' (1880); 'All on a Summer's Day' (1882), and 'Magnolia' (1896), operettas; 'Phyllis' (1897), a romantic opera, produced at the Waldorf-Astoria Theatre 7-21 May 1900; 'Ticonderoga,' a string quartette; and a cantata.

Warren, Samuel, English novelist: b. Denbighshire, Wales, 23 May 1807; d. London 29 July 1877. He studied medicine at Edinburgh and law at the Inner Temple, was called to the bar in 1837, and was made queen's counsel in 1851. He was recorder of Hull (1854-74), represented Midhurst in Parliament (1856-9), and was appointed master in lunacy in 1859. His earliest work, 'Passages from the Diary of a Late Physician' (1832), appeared in several editions in both England and the United States, but his most popular work was 'Ten Thousand a Year' (1841), which has passed through many editions. It appeared in an abridged form in 1903. He published various other works, including 'Now and Then' (1847); 'The Lily and the Bee' (1851); and several law books.

Warren, William Fairfield, American educator: b. Williamsburg, Mass., 13 March 1833. He was graduated from Wesleyan University in 1853, ordained in the Methodist ministry in 1855, and for several years was professor of systematic theology at the Mission Institute, Bremen (now Martin Institute, Frankfurt) Germany. In 1866 he became acting president of the Boston Theological Seminary, and from 1873-1903 he was president of Boston University, occupying, also, during that time, the chair of philosophy of religion and comparative theology. His writings include: 'The True Key to Ancient Cosmology' (1882); 'Paradise Found,' published also in Japanese, Chinese, Spanish, and German (1885); 'The Story of Gottlieb,' translated into German and Arabic (1890); 'Constitutional Law Questions in the Methodist Episcopal Church' (1894); 'The Religion of the World and the World's Religion' (1900); etc.

Warren, Ill., village in Jo Daviess County; on the Illinois C., and the Chicago, M. & St. P. R.R.'s; about 26 miles east by north of Galena and 25 miles northwest of Freeport. It is in an agricultural and stock-raising region, and near

the lead mines of the Galena district. A good quality of tobacco is grown in the vicinity. The chief industrial establishments are flour mills, creameries, and tobacco factories. The village has a high school, graded schools, a public library, and a State bank. Pop. (1910) 1,500.

Warren, Ind., town in Huntington County; on the Salomonie River, and on the Toledo, Saint Louis & Kansas City Railroad; about 75 miles north by west of Indianapolis and 15 miles south of Huntington, the county-seat. It is in a region of good farm lands and in a natural-gas and petroleum belt. The chief manufacturing establishments are flour and lumber mills, cooperage, and machine shop. There are large shipments of hay, grain, and live stock. Pop. (1910) 1,702.

Warren, Maine, town in Knox County; on Saint George's River, and on the Maine Central Railroad; 60 miles northeast of Portland. It was first permanently settled in 1736, though it was known as a trading post as early as 1631; it was incorporated as a town in 1776. There are large deposits of limestone in the town, and the river affords power for manufacturing, the town contains cotton and shoe factories, and a powder mill. There is a public high school. Pop. (1910) 1,812.

Warren, Mass., town in Worcester County; on the Chicopee River, and on the Boston and Albany Railroad, 18 miles west of Worcester. It includes the villages of Warren and West Warren. It was first settled in 1731, and in 1741 was incorporated as a town under the name of Western. In 1834 the name was changed to Warren. It contains cheese factories, cotton and woolen mills and manufactories of steam pumps and engines. It has a public high school established in 1870, and a public library of about 10,000 volumes (1904) founded in 1876 by a library association. Pop. (1910) 4,188.

Warren, Ohio, city, county-seat of Trumbull County; on the Mahoning River, and on the Pennsylvania, the Erie, and the Pittsburgh & W. R.R.'s; about 50 miles southeast of Cleveland and 15 miles northwest of Youngstown. It is a region where much of the land is good for farming, but the chief industries of the city are connected with manufacturing iron products. Some of the principal manufactures are rolling mill products, flour, lumber products, automobiles, tubing, bath tubs, electric lamps, foundry and machine-shop products. In 1900 (government census) there were 110 manufacturing establishments, capitalized for \$2,952,697, and employing 2,081 persons to whom was paid annually the sum of \$997,455. The principal public buildings are the county court-house, the municipal buildings, churches, and schools. There are a high school, public graded schools, and a public library containing about 10,000 volumes. There are five banks, capitalized for \$500,000 and having deposits amounting to \$2,949,940. Warren was founded in 1799; incorporated in 1834. Pop. (1910) 11,081.

Warren, Pa., borough, county-seat of Warren County; on the Allegheny River, and on the Pennsylvania, the Western N. Y. & P., and the Dunkirk, A. V. & P. R.R.'s; about 120 miles northeast of Pittsburgh and 20 miles south

WARREN — WARENAMBOOL

of Chautauque Lake, N. Y.; long 79° 15' W., lat. 41° 50' N. It is in an agricultural and oil region, but the chief industries are connected with oil products and manufacturing. The principal manufacturing establishments are iron works, lumber mills, oil and gas engine factories, boiler works, piano factories, and furniture factories. Other manufactures are wood alcohol, oil and the by-products, glue, barrels, machinery used with oil wells and for manufacturing. In 1900 (government census) there were 119 manufacturing establishments, capitalized for \$2,869,000, and employing 1,270 persons to whom was paid annually the sum of \$585,590. The raw material used cost \$2,357,681, and the value of the total annual products was \$4,152,859. The principal public institutions are the county court-house, the State Hospital for Insane, the churches and educational institutions. There are 15 churches representing seven different denominations. There are seven public schools, one R. C. parish school, four private schools, a public library containing about 12,000 volumes. The five banks (November 1903) had a combined capital of \$575,000 and deposits amounting to \$4,534,350. The government is administered according to the Pennsylvania statutes for boroughs, which provides for a burgess and a council of 14 members who hold office three years.

Warren was settled in 1795 by Daniel McQuay, and was incorporated in 1832. The village of Gade was annexed in 1895. There are a large number of foreign-born inhabitants, chiefly Germans and Scandinavians. Pop. (1910) 11,080.

JAMES H. BURGER,
Secretary Board of Trade.

Warren, R. I., town in Bristol County, on the Warren River and Narragansett Bay, and on the New York, New Haven and Hartford railroad; 10 miles southeast of Providence. It was the old Indian town of Sowamset; a trading post was established there by white men as early as 1632, but permanent settlement was later. It was in the territory in dispute between Rhode Island and Massachusetts, and originally formed a part of the town of Swansea, Mass.; after the boundary was settled and Warren came under the jurisdiction of Rhode Island it was incorporated as a town (1747); in 1770 the town of Barrington was separated from it. From 1764-70 it was the seat of the College of Rhode Island (now Brown University). During the Revolutionary War the town was pillaged by the British, and a number of houses burned. It is now largely a manufacturing town, its manufactures including cotton goods, braid and twine. It has a public high school, and the George Hall Free Library. Pop. (1900) 5,108; (1910) 6,585. Consult Fessenden, 'History of Warren.'

Warren, (1) A tract of ground appropriated to the breeding and preservation of game or rabbits; also, a preserve for fish in a river. (2) In English law, a franchise or place privileged by prescription or grant from the crown for keeping beasts and fowls of warren, which are hares, rabbits, partridges, and pheasants, though some add quails, woodcocks, and water fowl. The warren is the next franchise in degree to the park, and a forest, which is the highest in dignity, comprehends a chase, a park, and a free warren.

Warrensburg, wô'renz-bûrg, Mo., city, county-seat of Johnson County; on the Black River, and on the Missouri Pacific Railroad; about 65 miles southeast of Kansas City. It is in a fertile agricultural region, and in the vicinity are large sandstone quarries. It has several mineral springs, noted for their medicinal properties. The springs and climate have much to do with making the city a favorite pleasure and health resort. The chief manufacturing establishments are flour mills, foundry and machine shops, wagon and carriage factories, and woolen mills. It has grain elevators, coal and stock yards. The city has the State Normal School for the Second District, a high school, and graded elementary schools. The three banks have (1903) a combined capital of \$100,000 and deposits amounting to \$837,440. Pop. (1910) 4,689.

Warrenton, Va., town, county-seat of Fauquier County; on the Southern Railroad; about 50 miles southwest of Washington, D. C. It is in the region of the foot-hills of the Blue Ridge, and its picturesque scenery and cool climate in summer have made it a favorite summer resort. It has seven churches, a high school, Fauquier Institute, private select schools, a national bank and a private bank. The town has gravity waterworks. Pop. (1890) 1,346; (1900) 1,627; (1910) 1,720.

Warrington, wôr'ing-tôn, England. ~ manufacturing town in Lancashire, on the river Mersey and the Manchester Ship Canal, near the Sankey and Bridgewater Canals, 15 miles east of Liverpool. The Latchford locks are notable features of the ship canal at Warrington. The public buildings and institutions include: the restored parish church of St. Elphin, in Decorated style; other modern parish churches; Nonconformist and Roman Catholic churches; the town-hall, in classical style; the museum, containing a free library and municipal art-gallery; the grammar school, blue-coat school, clergy orphan daughters' school, St. Elphin's schools, a training college for school mistresses, a municipal school of art, technical schools, and other educational institutions; post-office; public baths; new police premises; the market-hall; municipal gas works, waterworks, tramways, electric light works, and works for the treatment of night-soil; an infectious diseases and a smallpox hospital, and an infirmary; a gymnasium; a public cemetery; public parks and gardens; and military barracks. Of the numerous industries of the town the most important are the manufacture of iron and iron goods, wire, leather, soap, and beer. Warrington is an ancient town, and had at one time a house of Augustinian friars. The famous academy, which existed here from 1757 till 1783, had among its teachers Dr. Joseph Priestley, Dr. William Enfield, Dr. Aikin, Dr. John Taylor, the Rev Gilbert Wakefield, and other eminent men; it is now represented by Manchester College, Oxford.

Warnambool, wâr'nâmb-bool, Australia, a seaport town in Victoria, on Warnambool or Lady Bay, 166 miles southwest of Melbourne. The principal public buildings are the Episcopal, Roman Catholic, and other churches, various banking and insurance offices, mechanics' institute, the Odd Fellows' and the volunteer artillery halls, a hospital, and benevolent asylum,

WARS OF THE WORLD

etc. Steamers ply regularly several times a week to Melbourne, and a good trade is done from the port in wool and other agricultural produce. The town contains a flour mill, biscuit factories, boot factories, tanneries, breweries, etc.

Wars of the World. The story of the wars of the world, if told in anything like its entirety, would be practically a history of the human race, for wherever nations have risen to greatness and have bred men capable of performing great deeds the records of these acts of heroism have almost invariably been made on those fields of battle upon which the supremacy of the nation itself has been accomplished. In the record of the wars of the world the student may read the tale of human progress—the story of the advance of civilization—for it cannot be denied that man's high place in the world to-day is largely a reward bestowed upon him in return for the brutality and bloodshed of the battlefields upon which his ancestors fought. That there have been wars that have been unnecessary is a fact that cannot be questioned, any more than one would deny that warfare has often been unnecessarily brutal, and yet, from a logical point of view, these are merely incidents which reflect upon but do not detract from the integrity of the original propositions: that war is the means by which superior nations have attained their superiority; that by war civilization was extended, and that in the winnowing process afforded by such international conflicts the fittest alone have survived and all that which was opposed to human progress or contrary to the best interests of civilization has been cast aside, to be lost and, eventually, forgotten by all save the historian who does not deign to record the most ignoble things in the life and customs of the earth's peoples.

Early History.—Unfortunately it is impossible to state, even approximately, when the first battle of the world was fought. In the early ages, of course, primitive man had all he could do to maintain a bare existence and preserve himself against the fury of the wild beasts so eager to attack him; but even tradition furnishes no clue to enable the student to discover at what period men first turned against other men to do battle with the crude instruments that had been devised only as a means of protecting themselves from the savage animals in the forests. All we know is that Osymandyas of Egypt, supposed by some to be the Osiris of the priests, is the first warlike king mentioned by history. He passed into Asia and conquered Bactria, about the year 3100 B.C. If Osymandyas was the first warlike king, however, he was not the last, for it has been estimated that since his time no less than 6,860,000,000 men have lost their lives on fields of battle; but, in spite of this gruesome record men have fought and will probably continue to conduct wars against each other, while all nations will be compelled to arm themselves with the latest fighting inventions, for, with the history of the past to guide them, they realize only too well that the Power that is not always prepared to protect its rights and properties with the sword may not unlikely find itself with very little except its honor to defend. Probably the first wars originated in nomad life and these conflicts were undoubtedly occasioned by the disputes which arose between the various

tribes in regard to their rights of possession in favorable pasturage. When all tribes devoted themselves to the flocks and herds there was little to discriminate between them, but, gradually, certain tribes began to assume different characteristics. One became attached to the art of agriculture; another devoted its time to hunting and fishing, while a third class still remained shepherds of the flocks. It was this difference of occupation which finally became the natural source of hostilities, for it established a series of classes, the stronger of which began to prey upon the weaker. Naturally, those who devoted themselves to the hunt became the victors in war, and, by reducing their victims to a condition of slavery, threw the manual labor, which they despised, upon the shoulders of others. In fact, there is a tradition in western Asia, that Nimrod, who is mentioned in the Bible as "a mighty hunter before the Lord," was the first person to engage upon an extensive system of warfare for the express purpose of obtaining slaves, and that it was he who introduced the practice of requiring conquered nations to pay an annual tribute, or, in other words, a ransom for their release. However true this may be we find that the ancient Old Testament days were full of such warfare, warfare in which the outcome was either tribute or slavery. History began on the banks of the Nile, and along the Tigris and the Euphrates; for these valleys, like two great oases, were practically the only habitable spots in the great desert. Fitted with all known conveniences for travel, with roads suitable for the passage of vast armies, these two centres of habitation finally became great rivals. In fact, whenever any particularly energetic ruler appeared in either spot he at once set out, as if moved by an irresistible impulse, to conquer his rival and so control western Asia. It may truthfully be said, therefore, that the history of this time is little more than one continuous record of struggles between Egypt and Mesopotamia, a condition which existed until Europe entered the lists and became the conqueror. In Egypt, during this age, the military class held such a prominent position in society that fully one third of the land was in the possession of the 410,000 men who composed the army.

As the Persians trusted for success mainly to numbers, war to them was little more than an exhibition of brute force. Sometimes as many as 1,000,000 men were brought into service for one campaign. In battle the troops were massed in deep ranks, those which were supposed to be the bravest being in front, but, if the line of battle was once broken, defeat appears to have been inevitable, for the army lost heart, even if the commander himself did not set the example of flight, and the general stampede that followed usually cleared the battlefield. Rawlinson's description of the appearance of the Persian forces in time of war is one of the most vivid word pictures painted by any historian:

The troops were drawn from the entire empire, and were marshalled in the field according to nations, each tribe accoutred in its own fashion. Here were seen the gilded breastplates and scarlet kilts of the Persians and Medes, there the woollen skirt of the Arab, the leathern jerkin of the Berber, or the cotton dress of the native of Hindustan. Swart savage Ethiopians from the Upper Nile, adorned with a war paint of white and red, and scantily clad with the skins of leopards and lions, fought in one place with huge clubs, arrows tipped with stone, and spears terminating in the horns

of an antelope. In another, Scythia, with their loose spanned trousers and their tall pointed caps, dealt death around from their whirling bows; while near them Amyrians, habited, and wearing corselets of quilted linen, wielded the tough spear or the still more formidable iron mace. Rude weapons, like cane bows, unfethered arrows, and staves hardened at one end in the fire, were seen side by side with keen swords and daggers of the best steel, the finished productions of the workshops of Phœnicia and Greece. Here the bronze helmet was surmounted with the ears and horns of an ox; there it was superseded by a fox-skin, a lantern or wooden skull cap, or a band drawn fashioned out of a horse's scalp. Besides horses and mules, elephants, camels, and wild asses diversified the scene, and rendered it still more strange and wonderful.

Wars of the Romans.—Although the Persians fought and won battles in spite of their crude methods of fighting, Greece was the mother of the art of warfare. Of course, it must not be imagined, however, that the splendid body of perfectly trained soldiery comprising the armies of Athens, Sparta, Thebes, or Macedon was the product of a day, or of the genius of a single man, for nothing less than centuries were required for the perfection of this wonderful force. In the heroic days, the days of the Homeric battles, the Greek soldiers were no more to be commended than their Persian rivals. Loosely organized, poorly drilled, and badly equipped, the mass of the army was capable of doing little more than give the inspiration of numerical strength to the small bodies of heroes who did all the fighting. At length, however, the idea of the phalanx evolved itself, and, in a remarkably brief period of time, the history of the world was changed. At no time prior to the invention of the modern instruments of war has man conceived such a formidable weapon as the attack of a charging phalanx. It was this powerful engine of war that accomplished the downfall of the Persian force at Marathon. It was a still more perfect phalanx that resulted in the defeat of Thebes and the victory of Macedon on the fields of Chæronæa. It was clearly the Greek phalanx—solid, erect and terrible in its effect—that enabled Alexander to inaugurate the campaign that had for its purpose the conquering of the entire known world. It was with the aid of the phalanx that Athens was preserved; that the Peloponnesian war was won by Sparta, and it was this same maneuver that saved the day for the Greek forces, until, at last, the Roman legions swept down upon a degenerate Macedon to declare the end of the Grecian empire. The story of Rome's supremacy is not dissimilar to that of the rise and fall of the Grecian power. She scorned to make use of the phalanx, her legions fighting in such open formation that those in the front rank could fall back, when weary, and allow those in the second file to advance and take their places, and yet the discipline and generalship of the great army was so perfect that it succeeded in establishing a wider empire than that of Alexander's, an empire which, in 133 B.C., included all of southern Europe from the Atlantic to the Bosphorus, as well as a part of northern Africa. Syria, Egypt and Asia Minor were then Roman dependencies. Her army had made her practically mistress of the civilized world. Several centuries elapsed before Rome's glories began to fade. During this time her power was still further extended, civil wars had been suppressed and revolutions crushed, for when the Roman army could fight according to the scientific rules of warfare it was practically an

invincible force. When the destroyers of the great empire came, however, they brought with them no knowledge of the science of war which Rome knew so well. To Alaric the Goth, Attila the Hun, and Genseric the Vandal, war was simply a question of mere numerical human strength. They had no more idea of the advancement in military art than had the Saracen horde that swept across the country and that might have planted the standard of Islam in every nook and corner of Europe if Charles Martel had not won his great victory on the plain of Tours. Against these three great barbaric leaders Rome was almost powerless, and as they swept down upon her, as one wave of the sea follows another, Rome fell, never to rise again. City after city was spoiled and burned; Rome, even, opened her gates without a blow. The tiara and purple robes of the empire were sent to Constantinople, and Zeno appointed Odoacer to be Patrician of Italy.

The Middle Ages.—From the fall of Rome and up to the close of the 15th century, wars were less frequent between nation and nation than among the various nations themselves. French fought French; Germans, Germans, and Spaniards, Spaniards, and even the war between the English and the French, the war that desolated France for more than a century, was no exception to this rule, for the enmity that was the cause of all the strife was not that of two rival nations, but was due entirely to the fact that the rulers of England were French princes, themselves hereditary sovereigns of French provinces, like Normandy or Poitou. Similar conditions existed in other parts of Europe so that the student who reads of the wars of the Middle Ages is struck by the absence of the well-planned and carefully executed campaigns that distinguished the warfare of both previous and later periods. There were civil wars, it is true; local insurrections, or single battles of more or less importance, but, with the exception of the invasion of the Saracens, the expeditions of Charlemagne, and the conquests of England by the Danes and the Normans, there is little to remind one of the well organized systems of warfare which distinguished the days of Greece and Rome, and which have since been revived by nations of modern times. It was not until almost the close of the Middle Ages that anything was done to improve the art of war as it was known to the ancients. Then the invention of gunpowder and the abandonment of armor revolutionized the science of fighting. Strange as it may seem, however, gunpowder was known for more than two centuries before the French, at the close of the 16th century, armed their soldiers with matchlock muskets, while conservative England, fearing that archery would be superseded, forbade the use of the new weapon as late as the time of Henry VIII.

Modern Warfare.—By Gustavus Adolphus, "the father of the modern art of war," as he is called by Col. Dodge, his biographer, the new weapon was accepted at its true worth, and, arming his corps with them he evolved the then original plan of preparing an attack with artillery. The adoption of the musket, however, was not the only development in warfare that may be traced to this great strategist, for it was he who first substituted the line for the mass formation, one of the greatest innovations in modern tactics.

WARS OF THE WORLD

It was not until the close of the Middle Ages, therefore, that military science, having slept for centuries, awoke to the possibilities of greater perfection in armament as well as in discipline. From the time of Gustavus Adolphus and Frederick the Great up to and after the close of the Civil War in America, military methods were undergoing such a change that the period may be regarded as that of the rehabilitation of the science of warfare, for nearly every kind of arm or maneuver that was in use during the Middle Ages has now become obsolete. In the accomplishment of all this improvement in armament and tactics credit is due to all the great generals, including Napoleon, who hired the best mechanics to make experiments for him and who gave to Europe its first breech-loader. To-day, however, everything but the small calibre rifle, and possibly the bayonet, has been relegated to the scrap heap, just as the antique fighting tactics, like the various variations of the phalanx and mass formations have given place to a more and more open formation, as the perfection in the fighting arms has required such alterations in the fighting methods of the world's armies.

Decisive Battles.—Creasy, the historian of warfare, who treats of incidental battles rather than of connected wars, selects the following as the "Fifteen Decisive Battles of the World":

1. Marathon, at which, on 26 Sept. 490 B.C., 11,000 Greeks defeated a Persian force numbering more than 110,000 men. The Greek army was commanded by such generals of genius as Miltiades, Aristides, and Themistocles. The Persian army was forced to retreat to Asia.

2. Syracuse, 419 B.C., when the besieged Syracusans turned upon the invading Athenians, almost completely destroying their forces, driving them, "with happy slaughter, over the cliffs, which an hour or two before they had scaled full of hopes and confident of success."

3. Arbela, the battle between Alexander the Great and Darius Codomannus which decided the fate of the Persians; 1 Oct. 331 B.C.

4. Metuerus, at which Hannibal, the brother of Hannibal, was defeated and slain by the Roman army under the command of Livius and Claudius Nero; 207 B.C.

5. Teutoburg, 9 A.D., the battle at which Varus and the Romans were defeated by the Germans, and which was regarded at Rome as such a national calamity that Augustus is said to have cried aloud in agony, "Varus, give me my legions!"

6. Chalons, at which, in 451 A.D., Aetius defeated Attila the Hun, compelling him to retire into Pannonia.

7. Tours, at which Charles Martel saved Europe by his great victory over the invading hosts of the Saracens. This conflict is also sometimes known as the battle of Poitiers; 732 A.D.

8. Hastings, at which, on 14 Oct. 1066, Harold II. of England lost his life and kingdom in battle against William, Duke of Normandy.

9. Orleans, besieged by the English during October 1428, it was bravely defended by Goucor, who realized that its fall would bring ruin to the cause of Charles IV. of France. On 8 May 1429, the siege was raised as the result of the heroism of Joan of Arc.

10. The Spanish Armada, the naval battle at which the Spanish fleet was almost completely destroyed by the British.

11. Muenheim, at which the French and Bavarians were defeated by the English under the Duke of Marlborough, 2 Aug. 1704.

12. Poltava, where Charles XII. of Sweden was completely defeated by the Saxons; 1 May 1709.

13. Saratoga, the engagement regarded as the greatest almost suffered by the British forces during the Revolutionary War in America. At this battle, fought on 17 Oct. 1777, the British general, Burgoyne, still flushed by his victory at Germantown, was obliged to surrender his entire force of 5,701 men to the American commander, General Gates.

14. Valmy, where the French, commanded by Kellerman, defeated the Prussians, commanded by the Duke of Brunswick, 20 Sept. 1792.

15. Waterloo, at which the great Napoleon was compelled to accept defeat at the hands of the Duke of Wellington's forces; 18 June 1815.

Wars of the World.—Irrespective of the character of the individual battles the following list of the most important wars that have been waged between the various nations since the Middle Ages is generally regarded as reasonably complete and thoroughly representative:

1455-1485. *The War of the Roses*, which ended with the defeat and death of Richard III. at Bosworth, 26 Aug. 1485. The war was between the Lancastrians and the Yorkists and obtained its name from the fact that the former wore the red rose as their emblem, and the latter, the white. The union of the roses was consummated in 1486, when Henry VII. was married to Princess Elizabeth, daughter of Edward IV.

1587-1588. *War of the Armada*. In 1587 Philip II., King of Spain, collected and equipped what he believed to be an invincible fleet, for the purpose of effecting the subjugation of England. Although it consisted of more than 130 ships and was manned by picked men, it was practically destroyed by the British fleet, commanded by Sir Francis Drake, Sir John Hawkins, and Lord Charles Howard, 29 July 1588.

1618-1648. *The Thirty Years' War* between the Catholics and Protestants of Germany. Beginning in Bohemia, in 1618, it ended with the Peace of Westphalia, 30 years later.

1648-1652. *The Civil War of the Fronde* may not be one of the great wars of the world, but it is so thoroughly representative of the conditions of the times that it is usually included in such lists. It originated in the minority of Louis XIV., and during the reign of Queen Anne of Austria and Cardinal Mazarin, and was strictly a war of classes. On one side were ranged the supporters of the court and the nobility, while the citizens supported by the Parliament, were pitted against them. It ended with the ignoble defeat of Condé at the battle of Saint Antoine.

1702-1713. *War of the Spanish Succession*, a conflict which arose over the question whether an Austrian or a French prince should succeed to the throne of Spain. From the beginning the British court was opposed to Louis and the succession of the Duke of Marlborough would have delivered the throne to the Austrians if the allies, by withdrawing one after another, did not leave the Bourbons free to succeed.

1741-1763. *War of the Austrian Succession*. At the death of Emperor Charles VI., his daughter, Maria Theresa, attempted to assume control of the throne which the great powers of Europe had guaranteed to her under the law known as the Pragmatic Sanction. Contrary to their agreement, however, all the powers except England determined to rob her of her inheritance. The plot failed and the peace of Aix-la-Chapelle was signed, Frederick the Great being the only monarch to profit by the conflict. He was bought off by the cession of Silesia.

1756-1763. *The Seven Years' War* was the result of Maria Theresa's determination to recover the Silesian territory which she had ceded to Prussia. By careful diplomacy an alliance was formed between Austria and France, Russia, Saxony, Sweden and Poland, leaving England as the only power to which Prussia could look for support. Although it was believed that Frederick would be unable to stand against such odds he was so generally victorious that he was not only able to retain his control over Silesia, but his successes in battle established the position of Prussia as one of the five great nations of the world.

1775-1783. *War of the American Revolution*. The revolt of the American colonists as a protest against English oppression is one of the most serious conflicts in which England has been engaged, costing, as it did, the greater part of her American possessions. The war culminated with the signing of the treaty of Paris, 30 Nov. 1783.

1789-1794. *War of the French Revolution*. The uprising in France was distinctly a class awakening, but it resulted in the abolition of the monarchy and the establishment of the first republic. During this period of internal agitation, however, other nations took advantage of the supposed opportunity to meet France with less danger to themselves, and yet, during the very days when the Terrorists were sending their victims to the guillotine the republican army was enjoying such continued success that several threatened frontiers were pacified, Belgium was overrun, Holland conquered, and peace was signed with Prussia and Spain.

1794-1797. *The Italian Campaign*. Bonaparte, the new military figure in European affairs, was given his first opportunity to exhibit his great genius for generalship, for with a force of 36,000 men he destroyed everything but courage, he advanced upon three well-equipped bodies of the flower of Italian and Austrian soldiery, vanquished them and was already in the act of advancing upon Vienna when the Austrian govern-

WARS OF THE WORLD

ment, in consideration, asked for a suspension of hostilities. The treaty of Campo Formio, signed in 1797, was the result. By this France took Belgium and the long-covered boundary of the Rhine while Venice and its dependencies were apporportioned to Austria.

1805-1815. *The Wars with Bonaparte*, which may be said to have commenced with Austria and to have ended only with Waterloo, occupied the attention of Europe for more than 10 years. The third coalition, which was formed in 1805, Napoleon's projects of advancement, consisted of England, Austria, and Russia, but the "sun of Austerlitz" went down upon a defeat so crushing that the conquerors were glad to accept the terms of the treaty of Pressburg, even at the cost of the very existence of the Holy Roman Empire which had continued for more than 1,000 years. In 1806 a fourth coalition, composed of Prussia, Russia, and England, was formed, but in one day Napoleon annihilated these powers, and, entering Berlin, lifted even the tomb of Frederick the Great. A year later, they saw the humiliation of Russia made complete, for while the battle of Eylau may be said to have been indecisive, there could be no question about the victory of Friedland, and Alexander, forced to sue for peace, signed the treaty of Tilsit. The Peninsular Campaign in 1808, the war with Austria in 1809, and the war in Spain, 1808-12, were continuous exhibitions of the power of the French Bonaparte, and it was not until the Russian campaign, 1812, when the French army retreated from Moscow like a mass of straggling fugitives, that the powers of Europe saw an opportunity to shake off the yoke which the bold usurper had forced them to bear. Again there was a coalition formed, a gigantic confederation of power which included the forces of England, Russia, Prussia, and Sweden, and while Napoleon's new army succeeded in defeating the allies at Lutens, Bliuzer, and Dresden, his own fall at the terrible battle of Ligny was his last to Paris to prepare for the inevitable fall which Fortune had in store for him, the fate of Waterloo and his own abdication.

1812-1814. *The War of 1812* between Great Britain and the United States, which was caused by the aggressions of the British and their refusal to recognize the rights of the American republic on the high seas, resulted in the defeat of the English invaders. It concluded with the treaty of Ghent, signed 18 Dec. 1814.

1821-1829. *The Greek War of Independence* was the culmination of four centuries of Turkish bondage. Prior to this there had been several attempts, all of which had been crushed with religious cruelty, but the revolt that broke out in 1821 was of a different character, as many Europeans contributed both their money and their services to aid the Greek insurgents. During the contest which followed fully one half of the population is said to have perished, and the Turks, who had called the Egyptians to their assistance, were finally overwhelmed by the revolutionists whom England, Russia, and France formed a league to help the Hellenes. As the result the fleets of the combined forces defeated the Turks and the Egyptians in the bay of Navarino, the French troops drove the Egyptians from the Peloponnese, and freedom for Greece was at last attained.

1831-1839. *The Belgian War of Independence* was inspired by practically no other cause than that of a desire for freedom. The revolutions in America, in France, and in Greece were a means of inspiration, and as Belgium had never been in sympathy with Holland it required but a spark to kindle the flame of insurrection. In 1830, therefore, the independence of Belgium was declared.

1845-1848. *The Mexican War* with the United States resulted from the annexation of Texas, the independence of which had never been recognized by the Mexican government, and from Mexico's refusal to treat with the United States regarding the adjustment of the boundary. After several sharp engagements, in nearly all of which the United States forces were overwhelmingly victorious, Mexico was taken and peace was proclaimed, 2 July 1848.

1853-1855. *The Crimean War* grew out of a dispute between the Greek and Latin churches as to the right of exclusive possession of the Holy Places in Palestine. France and Russia took opposite sides upon the question, but when a mixed commission decided in favor of the Greeks and against France the French armed. Russia, on the other hand, continued to make demands upon the Sultan, commanding among other things that the czar be recognized by treaty as the official protector of Christians within the limits of the Turkish domain. In 1853 the czar also proposed that England should join him in partitioning the Sultan's empire, a proposition which was immediately refused. In view of the strained relations, however, it was but natural that Turkey should declare war against Russia. In 1854 both England and France came to the Sultan's aid, and an expedition against the Crimea having been decided upon, the allied forces, numbering nearly 60,000 men, attacked the Russians, who, under the command of Prince Menshikoff, had entrenched

themselves, 30,000 strong, on the heights of Alma, a position which was supposed to be unassailable. In spite of this, after one sharp contest, the Russians were routed. Peace was proclaimed in April 1856.

1856-1857. *The Persian War*. The taking of Mesopotamia by the Persians, 25 Oct. 1856, was considered such a violation of the treaty of 1853 by the British that war ensued between Great Britain and Persia. Several sharp battles followed, in which the Persian forces suffered defeat, and final peace was proclaimed in April 1857.

1857-1859. *The Indian Mutiny*, which continued for nearly two years, grew out of a result of the sepoy, or native soldiers in India. The original cause of the trouble was that the cartridges given to them were said to be greased with tallow or lard, which was regarded as an insult to their religious, a Hindu being forbidden to touch cows fat and a Mohammedan, lard. It was this in 1856 before the rebellion was finally crushed, while in the meantime, the white residents at Delhi, Cawnpore, and many other places were massacred with terrible brutality. Those at Lucknow were just able to hold the city until relief arrived.

1861-1865. *The Civil War* in the United States, which resulted in the defeat of the Southern forces, the re-establishment of the Union, and the emancipation of the negro.

1868-1898. *Cuban War for Independence*. Although the first attempt to wrest the island of Cuba from the hands of Spain was made as early as 1850, the first insurrection or formal revolution, did not occur until the fall of 1868. From that time, however, revolutions were of frequent occurrence, but all were suppressed by the Spanish forces until 1898, when the United States formed an alliance with the revolutionists, thus enabling Cuba to obtain the freedom that had so long been denied.

1870-1871. *The actual cause of the Franco-Prussian War* was the jealousy of Emperor Napoleon, who had been an important witness of the success of Bismarck's negotiations, which had resulted in the greatly increased power of Prussia. More definite causes were found, of course, the refusal of France to permit the French to purchase Luxembourg from the king of Holland, and the effort of Bismarck to place Prince Leopold of Hohenzollern-Sigmaringen on the throne of Spain being two of them, but it is the consensus of opinion among historians that the war was both precipitated and unjust, and that as the emperor had been unprepared both as to the numerical strength of his army and as to its state of preparation, his surrender was practically a foregone conclusion from the beginning of the conflict.

1876-1903. *The Anglo-Boer War*. Although preceded by lapses of several years the hard feeling which always existed between Great Britain and the small South African republics resulted in many serious disturbances which culminated, in 1899, in the Anglo-Boer War, the complete victory of the English arms and the annexation of the South African territory.

1877-1878. *The Russo-Turkish War*. The spirit of revolution which spread through nearly all the Turkish possessions during 1875 and 1876 and which resulted in the revolt of Bosnia and Herzegovina and Bulgaria, and the declaration of war by Serbia and Montenegro, was the immediate cause of the Russo-Turkish war, which ended with Russian victory, 3 March 1878.

1894-1895. *Chinese-Japanese War*. A revolt in Korea and a call upon China for assistance was the direct cause of the conflict between China and Japan. When the latter power uninvited sent troops with a proposal of joint action against the revolutionists, China protested vigorously, and after much dispute the war began. It resulted in Japanese victory and the cession of much territory on the part of China, considerable of which Japan was compelled to relinquish because of the protests of Russia, France and Germany.

1898-1902. *The Spanish-American War* was the natural outcome of the interference of the United States in the war between Spain and her revolutionary colony, Cuba. Having fought with great bravery and against almost overwhelming odds for years the state of insurrection had degenerated into such barbarous cruelty on the part of those who were striving to suppress it that the American people decided that it had passed the bounds of humane warfare. For this, and several other reasons, Congress determined to give assistance to Cuba, upon which war was promptly declared. It resulted in overwhelming defeat for the Spanish forces, independence for Cuba and the accession of considerable colonial territory by the United States.

1904. *Russo-Japanese War*. Russia's eagerness to extend her territory to such an extent as to secure ports that should be open at all seasons of the year — a desire which made her set upon Manchuria with a firm hand and tempted her to cast covetous eyes upon Korea — was the cause of such persistent objection upon the part of Japan that the Russo-Japanese war resulted.

JOHN R. MEADER,
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WARSAW — WARSHIPS, ANCIENT

Warsaw, wâr'sâ, Ill., town in Hancock County; on the Mississippi River and on the Toledo, Peoria & Western railroad; 100 miles southwest of Peoria. Fort Edwards was established within the limits of the town in the War of 1812. The largest river steamers can ascend the Mississippi to the town; and it is a shipping point for the agricultural produce of the region. It also has several manufacturing industries, including cooperage works, flour and woolen mills, pickle works, and manufactories of agricultural implements. It contains a public high school. Pop. (1890) 2,721; (1900) 2,335; (1910) 2,254.

Warsaw, Ind., city, county-seat of Kosciusko County; on the Tippecanoe River, and on the Pittsburg, Ft. W. & C., and the Cleveland, C. C. & St. L. R.R.'s; 105 miles north of Indianapolis. It was settled in 1836, and chosen as the county-seat in 1837; it was incorporated as a town in 1854, and as a city in 1867. It is in a lake region, and is popular as a summer resort. It is also an agricultural region, and Warsaw is the chief trade centre of the county. It has large canning and pickling works, flour mills, creameries, and manufactories of agricultural implements. A large park and the county court-house are among its notable features. There is also a public high school established in 1872, and a public library. Pop. (1910) 4,430.

Warsaw, N. Y., village, county-seat of Wyoming County; in the valley of the Oatka Creek, on the Erie, and the Buffalo, R. & P. R.R.'s; 40 miles south-southeast of Buffalo. It was first settled in 1804, and was incorporated as a village in 1816. It is in an agricultural region; and there are important salt deposits in the vicinity. The village contains salt works, broom factories, manufactories of knit goods, a foundry, carriage factories, lumber and saw mills. It has a public high school, established in 1897, with a large library of about 15,000 volumes (1904). The water-works are owned and operated by the village. Pop. (1910) 3,206.

Warsaw, Russia, the former capital of Poland and now of a government, situated partly on a flat, and partly on a height rising gradually from the left bank of the Vistula, here crossed by an iron bridge 1,660 feet long, and by a railway bridge, communicating with the suburb of Praga, 325 miles east of Berlin. It consists of the city proper and several suburbs, enclosed for the most part along with it by a rampart and fosse, and dominated by a vast citadel erected by the Russians. In the older parts the streets are narrow, and the houses, generally of indifferent appearance, are huddled together without any order; in the newer part, and more especially in some of the suburbs, the streets are often spacious and many ranges of handsome buildings are seen. There are several large public squares, among which that of Sigismund, adorned with a bronze colossal statue of the third king of that name, is particularly deserving of notice; and the vicinity is well provided with beautiful promenades. The more remarkable public buildings are the Roman Catholic cathedral, the Russian cathedral, the church of the Holy Cross, the church of the Carmelites, the Lutheran Church, the Zamek or ancient castle of the Polish kings, a huge

pile on a height overhanging the Vistula; the palace of Casimir, occupied by the university and adorned in front with a statue of Copernicus; the Saxon palace, with fine gardens attached to it; the Krasinsky palace, occupied partly by the superior courts of law and partly by government offices; several other palaces similarly occupied; the town-house, arsenal, mint, custom-house, exchange, barracks, several theatres, and the bazaar of Marieville, consisting of a large square lined with arcades. The principal educational establishments are the university, suppressed after the rebellion of 1830, reopened in 1864; a lyceum, technical, commercial, and many other schools. Among the benevolent institutions are a town and a military hospital, a foundling hospital, a deaf and dumb, and two lunatic asylums. The manufactures consist of metals, beer, tobacco, textiles, chemical products, furniture, artificial flowers, musical instruments, etc. The trade is very extensive, Warsaw being by far the most important commercial emporium of Russian Poland, and carrying on a large traffic both with the interior and with Thorn and Dantzic, by means of the Vistula. Warsaw, though very ancient, did not become the capital of Poland till about the middle of the 16th century, when it superseded Cracow. It has witnessed much warfare, the suburb Praga generally being the field of action. Here in 1656 the Poles were defeated by Charles Gustavus of Sweden. The chief interest belonging to the city is connected with the insurrection of 1794, when after the capture of Kosciusko at Maciejowice, the dispirited and disorganized remnants of the Polish army defended the ramparts of Praga against the victorious Russian forces under Suwaroff. On 3 Nov. 1794, the Russian general ordered an assault, and after a fierce struggle the ramparts were carried, more than 15,000 Polish soldiers being slain, drowned in the Vistula, or taken prisoners, and an almost equal number of unarmed inhabitants of every age and sex, brutally massacred. In the evening a great fire arose, which destroyed a large part of the city. The vicinity of Warsaw was also the principal seat of the Polish war in 1831. Pop. about 750,000, of whom above a fourth are Jews.

Warships, Ancient. Armorclads and protected war vessels were not wholly unknown to the ancients. The ships of the Greeks and Romans were often fortified with a thick fence of hides, which served to repel the missiles of their enemies and afford protection to their own crews. Hides, possibly brass and iron, and certainly thick timber, entered into the construction of the turrets and towers with which the fighting ships of ancient and mediæval times were fitted, especially when used for harbor defense, as in the Venetian turret ship of the 9th century. Felt made an early appearance as a defensive armor on shipboard, as we find that in a sea fight off Palermo in 1071 between the Normans and Saracens, the former hung their galleys with this material by way of a defensive cuirass. The Norman knights had probably adopted this device from their enemies, for felt had been used for some time for this purpose on board the huge "dromons" of the Saracens. These, the "battleships" of those days in the Mediterranean, usually rowed 50 oars a side, each oar being manned by two men, so that here we have a couple of hundred samson ac-

WARSHIPS, ANCIENT

counted for at once. When the soldiers, sail trimmers and artificers who worked the war engines and siphons for Greek fire are added, it is evident that the crew must have been very large, and have required a ship of considerable dimensions. These great warships were armored with woolen cloth soaked in vinegar to render it fireproof, and hung with mantlelets of red and yellow felt, so that their cuirass was not only useful, but ornamental as well. At this period and for many hundred of years later additional protection was afforded to those on deck by the ranging of the bucklers and shields of the warriors on board along the gunwales. Later, in the 15th and 16th centuries, special "pavesades," or bulwarks, were provided in lieu, composed of large oblong shields, supplied for the purpose. In addition to felt, the time-honored leather armor also entered into the defensive panoply of the "dromons," and in the war of the Sicilian Vespers, Pedro III. of Aragon covered two of the largest ships of his fleet with leather before sending it against Charles of Anjou. Conrad of Montferrat, at the siege of Tyre in 1187, either invented, or at all events, caused a special class of leather-protected vessels to be built, which were called barboats or duckbacks. They would now probably be called turtlebacks. They would appear to have been small craft covered with a strong leather-protected domed roof through portholes or openings in which the archers and crossbowmen could fire without exposing themselves. They proved very effective against the Saracens, and in 1218 the entrance of the Nile was forced by 70 of these little armorclads.

It is said that the Great Dromon—whose capture by Richard Lion-Heart is still commemorated—was equipped with leaden armor. This was in 1191, and probably lead was occasionally used for protective purposes throughout the next two or three centuries, although there is no record of any ship so protected until 1530. In this year the Knights of Saint John, those sworn opponents of the Turk, built one or perhaps two leadclads. At any rate, one account says that they built such a ship in this year at Malta, while another describes a ship of this kind called the "Santa Anna," launched at Nice in the same year. The Santa Anna's leaden armor plates were attached to her sides by bolts of brass, and it was said for her that she could "resist the artillery of a whole army," and at the same time could sail or row as fast as any of her unarmored contemporaries. She was a big ship, with six decks, a reception saloon, a chapel, a specially constructed powder magazine and a bakery. She was present at the taking of Tunis in 1535 and played an important part in its capture. Lead was not infrequently used at this period for sheathing ships under water, in the same way that copper is still found so useful. Thus the French ship *Grande-Françoise*, launched in 1527, one of the largest and most famous ships of her day, was sheathed with lead from her keel to the first wale above her waterline.

The Spaniards attempted to protect their galleons of the Invincible Armada by building their sides four or five feet thick, but the heavy English guns "lashed them through and through." But now at last we arrive at a real armored ship in the present day acceptance of the word. Not only an armorclad, but a real

ironclad. This was constructed in Antwerp in 1585, with a view of breaking through the lines of the Spanish army under Alexander of Parma, which was at that time closely investing the city. It was a large flat bottomed craft, with a central casemate or battery built of thick balks of timber and plated with iron. It was intended to be, and very likely was, impenetrable to any artillery that the Spaniards could bring against it; and in hopeful anticipation that their ironclad ship would raise the siege and put an end to hostilities, the men of Antwerp christened her the "Finis Belli." In addition to a heavy battery of guns, the *Finis Belli* carried a large body of musketeers, some of whom were stationed aloft in her four fighting tops, while the rear were well protected by the loop-holed bulwarks on the upper deck. Unluckily for the besieged Dutchmen, she ran aground before she had effected anything at all, and fell into the hands of the Spaniards, who nicknamed her the *Caranjamula*, or "Bogey." They contrived to get her afloat, and brought her down to the camp of Alexander of Parma, where she became a great attraction to the sightseers of the period. As for the Dutchmen in the doomed city, they henceforward only referred to their experiment as the "Perdita Expense" or "Wasted Money." Ten years previous to this, others of the Dutch patriots had built a somewhat similar contrivance, which very possibly was also armored. This was the *Ark of Delft*, a twin vessel supporting a floating fortress, which was propelled by three hand-worked paddle wheels placed between the two hulls.

It is a curious but well known fact that if we go to the Far East we can find a parallel to almost any Western invention. It is therefore not astonishing to find that the Japanese possessed a paddle-propelled armorclad in the year 1600. This quaint craft, like the old leather-clad "barbotes" of the 12th century, was turtlebacked, with ports for firing from. She was covered with iron and copper plates fitted together like the cells of a honeycomb, mounted 10 guns, and, like the *Ark of Delft*, was moved by a central paddle wheel. Though there is no record of any more ironclad ships before the 19th century, our own navy, at any rate, used various devices to protect its ships in the 18th. According to a French writer, the sailors of his country were astonished at the perfection to which the English had attained in this direction. "Old cables," he writes, "held in place by pieces of iron, barricaded the whole length of the bulwarks; mantlelets of old rope hung over the ship's sides, to diminish the shock of our cannon balls, and, beneath a thick rope, netting stretched from poop to bowsprit. The English fought under shelter, maneuvering, without ceasing, out of musket range, so as to riddle our detachments of fusiliers, with their cannon shot. So we lost 200 men for every 30 of the English put out of action."

This system of armoring was, however, soon adopted by the French. The Spaniards endeavored to improve on this, and in 1782 hoped great things from the celebrated floating batteries employed at the great siege of Gibraltar by the Duke de Crillon. The floating batteries were mounted on ships of the line, cut down to a particular size. On the top they were defended by a covering made of cordage and wet hides. This was not the complete protection

WARSHIPS, MODERN

that was originally intended by the Chevalier d'Arcon, their constructor, according to another account of the same date as the above, which states that "the covering was to have been laid over with strong sheets of copper, and by this means the red-hot balls, the bombs and other destructive implements would have slid off."

The fate of these experimental armorclads offered no inducement to the naval constructors of the day to make further researches in the direction of protection, so that till comparatively recent times we find our sailors depending only on their "wooden walls" to resist the projectiles of the enemy. The oaken sides of the British ships, we may note in passing, were often exceptionally stout and difficult to penetrate. In the fight between the *Glatton*, 56-gun ship, and four French frigates, a brig and a cutter, mounting 220 guns between them, their 12 and 24-pounders failed to penetrate her sides, and she beat them all off with great loss at the cost of one officer and one man wounded.

But the Americans, from the very commencement of their existence as a nation, set themselves to make improvements in naval warfare. David Bushnell constructed a practical submarine boat in 1773. Torpedoes were used by him and others in the war with this country, and for the purpose of towing these contrivances alongside our ships, they invented and built in 1814 a paddle-propelled turtlebacked boat lying very low in the water and covered with "half-inch iron plates, not to be injured by shot." About the same period the celebrated inventor, Robert Fulton, who had already constructed one or two submarine boats and various classes of torpedoes, built a steam frigate which he called the *Demologos*, or *Voice of the People*, but which is sometimes known as the *Fulton I*. This, the first steam warship ever constructed, had her sides no less than 13 feet thick of alternate layers of oak and ash wood, a thickness absolutely impenetrable by any gun then afloat. In 1829 this vessel was blown up by accident, and was succeeded in the American navy by the *Fulton II*, a ship which appears to have been protected by some kind of iron armor.

Various proposals were made to use iron plating to protect the sides of ships of war from this time forward, but until the French constructed a number of armorplated batteries for use in the Crimean war, nothing practical came of the suggestions of inventors. Their success at the bombardment of Kinburn demonstrated the value of armor plating. England at once followed suit with others of the same kind, some of which are still doing duty as hulks. Then came the French *La Gloire*, the British *Warrior*, the ironclads and monitors of the American war, and henceforward the steady evolution of the armored fighting ship, which has provided us with the majestic battleships of the present day.

Warships, Modern. It has become almost an axiom that military success, in a broad sense, depends upon command of the sea, and absolute command of the sea can only be attained in one way, by the capture or annihilation of the enemy's fleets. This makes it imperative that the enemy be met in battle, a result easily attained if he is of equal or superior force and, if his force is inferior, he must be made to fight. The questions of how, and when, and

where this should be done belong to the science of naval strategy, for our purpose it is enough to recognize that the destruction of his fleet is the paramount object, we may then turn to consider what means have been provided for accomplishing this end. It can readily be seen that this serious problem of bringing the enemy to battle and making him fight, whether he will or not, can only be met by providing vessels capable of navigating the seas in any weather, and capable of meeting and destroying, or fighting to a standstill, any class of vessel that may be brought against them. In the old days, when all ships were on an equal footing as regards the motive power, when there was no protection and when the best ship was the one carrying the most guns, the problem was simple; but now, when each vessel must carry her own fuel, when high speed requires a disproportionate share of space and weight, when the competition between gun and armor has developed so rapidly that each series of new guns requires either thicker or better armor for protection against its projectiles, the problem is much more complex, and though of late years the steel maker and the engineer have done much toward improving the quality of their products, its principal result has been to increase the quantity used in a given case.

Qualifications.—Having seen that the primary purpose, indeed the *raison d'être* of the true warship is to fight, it follows that the most efficient war vessel, in the sense of the present day, is that combining in the highest degree, offensive and defensive qualities. It may be said in a general way, that the most important of these qualities are armament, protection, radius of action, speed, and reliability of machinery. There are, however, great differences of opinion among naval experts and designers as to the relative importance of these qualities, which are all further complicated by subordinate and antagonistic elements, and to unite the whole, in the best possible ratio, is the aim of the designer of every warship projected. The above mentioned qualities may be altered proportionately, increasing one and decreasing another, but in every case there is one absolutely limiting factor which cannot be ignored, that is the total weight which a given vessel can carry. A ship of definite displacement can carry a certain number of tons weight with safety, and this weight may not be increased, so it follows that if any one quality is abnormally developed, some other quality or qualities, no matter how important, must be sacrificed. Thus every warship is a compromise in which the designers must nicely balance each element, an addition for some especially desirable feature entailing a reduction in something else considered not quite so important in view of the particular service to be required of the vessel. Being driven to these compromises and owing to the impossibility of uniting these discordant elements, each in its highest degree of excellence, in any one ship, designers have been forced to divide warships into a number of different classes, each class to fulfil special requirements and in each one of which one or more qualities reaches its highest development in accordance with the requirements of its class and the duties to be performed by the finished vessel.

Classification.—The principal classes of warships which exist at the present time, as the result of an evolution along diverging lines enforced by the mutual antagonist qualities are: battleships, armored cruisers, protected cruisers, gunboats, monitors, torpedo boats and destroyers, scouts, and some intermediate types combining the characteristics of several classes. In the navies of the larger powers, where expense need not be considered and where the number of vessels must perforce be large, the lines between the classes are fairly well defined, but in many of the smaller navies the effort has been to combine in one vessel too many high qualities, usually resulting in an inferior ship and one excelling in no respect, though there are a few cases of this kind where an exceptionally skilful designer has been remarkably successful in his combination of elements.

Before going into a detailed description of the different classes of warships it may be well to take a general survey of the subject and to revert to the principal qualities before mentioned. The statement that a vessel is constructed entirely of steel, implies no inherent strength in itself. All war vessels are now built of steel, and it is only when thick steel plates are secured to their sides or deck, for the express purpose of protecting their machinery, magazines, guns, and personnel from the fire of the enemy, that any advantage is derived from it. Beginning with the lighter ships, such as torpedo boats, small gunboats, etc., we find there is no protection whatever except, in some of the gunboats, that given by a judicious arrangement of the coal bunkers, and the slight protection afforded the gunners by the gun shields. On some of the larger gunboats and on all of the protected and armored cruisers as well as battleships we find the protective deck, a heavy steel deck, covering the whole of the vessel at about the level of the water line and protecting the machinery, boilers, magazines, etc. On some of the larger protected cruisers thin side armor appears; on the armored cruisers there is thicker side armor covering a greater area and, on this type, the turret or barbettes appears, while on the battleship the protection reaches its highest development.

Battleships.—The battleship represents the highest type of warship evolved at the present time, and from a purely military standpoint it is the most formidable and most necessary class of vessel, for upon the battleships fall the real burden of an offensive demonstration. The marked characteristics of the battleship are large guns and thick armor and these are the two qualities to which other elements, noticeably speed, are sacrificed. This sacrifice, however, must be made, for the battleship must bear the brunt of the heavy fighting and be able to give and receive the hardest possible blows. Speed is an important element and it is well for the battleship to have the highest speed possible as long as it entails no reduction in her fighting qualities; but speed never won a decisive battle and of all the elements entering into warship design high speed is the most uncertain, the most difficult to maintain in a high degree of efficiency, and it requires the greatest sacrifice in other qualities. The reason for this is that in a given ship the power, and consequently the weight and space occupied by the machinery necessary for an increase in speed, increases

in a much higher proportion than the speed gained. Thus a battleship that could make 17 knots with 12,000 horse-power, the machinery installation weighing 1,150 tons, would require, to make 20 knots, about 27,000 horse-power, the machinery weighing 2,570 tons. In addition to this, her greater power would involve a greater consumption of fuel per day, therefore a greater quantity or weight of fuel must be carried and, as before stated, the extra weight for machinery and fuel could only be obtained by a reduction in the armament, or protection, or both, or by an increase in size. When one notes that on a modern battleship the armament and ammunition is about 9 per cent, the protection about 25 per cent, the propelling machinery about 12 per cent, and the coal about 6 per cent of the total displacement, it can easily be seen how seriously a change in any one of these items affects the whole ship. The armament or battery of warships is divided into two classes, called respectively, the main and the secondary batteries. The main battery comprises the heaviest guns on the ship, those firing large shells and armor-piercing projectiles, while the secondary battery consists of small rapid-fire and machine guns for use against torpedo boats, or to attack the unprotected or lightly protected gun positions of an enemy. On the modern battleship the main battery usually consists of four 10-inch, 12-inch, or 13-inch breech-loading guns, mounted in pairs in revolving barbettes or turrets, one forward and one aft, on the centre line of the ship. Occasionally these guns are mounted *en barbette*, that is, the gun projects over a circular wall of armor, without the revolving turret or hood; it is not uncommon also, in foreign navies, to find but one gun in a turret or barbettes, and sometimes these turrets or barbettes, instead of being placed on the centre line of ship are *en echelon*, that is, the forward one on one side of the vessel, the after one on the opposite side. However, it is the almost universal practice at the present time to place the four heaviest guns as first stated, in pairs, in revolving barbettes or turrets, on the centre line of ship. In addition to these heavy guns it is usual to mount a number of smaller guns, from 3 to 8 inches diameter of bore, on each broadside, though often the 8-inch guns are also mounted in turrets. A battery arrangement that has obtained to a considerable extent in our navy is to have, in addition to the two turrets of 12- or 13-inch guns, four smaller turrets, each containing two 8-inch guns. These turrets are arranged in a quadrilateral, two on each side, the forward two somewhat abaft the forward large turret, and the after two forward of the after large turret, with in addition to this, a number of 6-inch or 7-inch guns mounted on the broadside. Later this arrangement has been somewhat changed by superposing one of the 8-inch turrets on each of the large turrets, the other two in some cases being placed one on each side of ship about amidships, while in other cases they were omitted entirely, their place being taken by a greater number of broadside guns. The *Indiana*, the first of our battleships, has the two large turrets referred to, each containing two 13-inch guns, the quadrilateral arrangement of four turrets each with two 8-inch guns and two 6-inch guns on each broadside. Next came the *Iowa* with a somewhat similar arrangement except that 12-inch and 4-inch guns were used in place of the 13-inch

WARSHIPS.

How view of " Dreadnought "						
BATTLESHIPS "SOUTH CAROLINA" (UNITED STATES) AND "DREADNOUGHT" (BRITISH) DESIGNED ON RESULTS OF JAPANESE WAR.						
	Year of Completion.	Displacement,	Speed.	Coal Supply.	Native Power.	Number of Gun--
SOUTH CAROLINA,".....	1910	16,000 tons	18½ knots	2,300 tons	2 Reciprocating Engines	Eight 12-inch
DREADNOUGHT,".....	1906	18,000 tons	21½ knots	2,700 tons	4 Turbines	Ten 12-inch

WARSHIPS, MODERN

and 6-inch guns respectively. She was followed by the Kearsarge class, with 4 13-inch guns in turrets, arranged as before, with a turret mounting 2 8-inch guns superposed on each 13-inch turret, and with a broadside battery of 14 5-inch quick-fire guns. Next came the Alabama class, with 4 13-inch guns, in the large turrets, no 8-inch guns at all and 12 6-inch guns on the broadside. After the Alabama class the 13-inch gun disappears, and in the Maine class, which followed, there are 4 12-inch, no 8-inch and 16 6-inch quick-fire guns. The Virginia class shows a return to the 8-inch gun, her arma-

the above we have confined ourselves to a description of the battery arrangements on the battleship class only. In the armored cruiser class a somewhat similar arrangement is followed, except that the guns in the main turrets are not above 10-inch bore, and are often 8 inches. As to the protected cruisers and gunboats, their batteries are so varied that they can best be considered by consulting the table which gives the batteries of a number of different classes of vessels.

The protection, that is, the armor on a battleship, is her most marked characteristic. The

9,500 I. H. P. Main Engine of a Battleship.

ment being 4 12-inch, 8 8-inch and 12 6-inch guns. On the Connecticut and Vermont classes, our largest battleships, we have 4 12-inch, 8 8-inch, and 12 7-inch, the latter being a new gun used here for the first time. On the latest battleships, the Mississippi class, we have 4 12-inch, 8 8-inch and 8 7-inch guns. The superposed turret was entirely an American idea and has not yet been introduced abroad. It has the advantage that, the number of gun positions being reduced, better protection can be given the guns and their accessories on the same weight, or the same protection given on less weight, leaving an allowance of weight to be used elsewhere. In

basis of all protection on the modern war vessel is the protective deck and it is common to the battleship, armored and protected cruisers and many gunboats. It is a heavy steel deck covering the whole of the vessel at or a little above the level of the water line, extending the entire length of the ship and firmly secured at the ends to the heavy stem and the stern post, and at the sides it usually slopes, meeting the sides of the ship 3 or 4 feet below the water line. Below this heavy deck lie the vitals of the vessel, the boilers and machinery, the magazines and shell rooms, the ammunition passages and all the parts where an explosion would be most dan-

WARSHIPS, MODERN

gerous and would create the greatest havoc. For safety every opening on this deck is covered with a heavy steel grating to prevent, as far as possible, fragments of shell from passing below. The most vulnerable part of the vessel is her water-line, for, if a shell should enter and explode here, tearing a large hole, she would probably quickly capsize and sink; it is here therefore that the heaviest armor, called the water-line belt, is usually placed. The lower edge of this belt rests on a projection or ledge, called the armor shelf, at the point of meeting of the protective deck and the ship's side; it is therefore 3 or 4 feet below the water-line and extends up about the same distance above. In the earlier battleships it was usual to run this

whole water-line of the vessel. The barbettes, one forward and one aft, about over the magazines, rest upon the protective deck at the bottom and extend up about four feet above the upper deck. At the top of the barbettes, revolving on rollers, are the turrets, sometimes called hoods, containing the guns and the loading mechanism and all of the machinery in connection with the same, and the turret ammunition hoists lead up through the barbettes from the magazine below, delivering their load of charge and projectiles at the breech of the guns in position for loading and, as they pass up inside of the barbettes and turrets, they are as well protected as is possible. It is usual to work an athwartship line of armor from the water-line belt to the barbettes, resting upon the protective deck, and this athwartship or diagonal armor is here the same thickness as the belt. We now have, enclosed within heavy armor a fort, citadel or redoubt, its bottom being the protective deck, its sides the water-line belt, and its ends the athwartship or diagonal armor, a barrette being placed at each end of the citadel, thus the space between the protective deck and the next deck above is well protected. Resting upon the armor belt and the diagonal armor, and following the same direction, is a course of armor usually somewhat thinner called the lower casemate armor; it extends up to the lower edge of the broadside gun ports and, resting upon it in turn is the upper casemate armor, following the same direction and forming the protection for the broadside battery. The explosive effect of the modern shell is so tremendous that were one to get through the upper casemate and explode immediately after entering, it would undoubtedly disable several guns and kill their entire crews; it is therefore usual to isolate each broadside gun from its neighbors by light nickel steel bulkheads $1\frac{1}{2}$ or 2 inches thick, and, to prevent the same disastrous result among the guns on the opposite side, a fore-and-aft bulkhead of about the same thickness is placed on the centre line of the ship. Each gun of the broadside battery is thus mounted in a space by itself, somewhat similar to a stall. Just abaft the forward turret there is a vertical armored tube resting on the protective deck and at its upper end is the conning tower, a protected station from which the ship may be worked in action, the tube giving protection to all the mechanical signaling gear leading to different parts of the ship, the steering gear, etc., while just forward of the after turret is another armored station for signaling. It is not a difficult matter to design a ship that will be practically unsinkable by the attack of gun fire, as it only means placing a sufficient thickness of armor at the water-line. A war ship might as well be sunk, however, as rendered useless in battle, and the one thing that modern naval battles have shown is the absolute impossibility of the unprotected personnel of a ship working her guns when exposed to the hail of shot and shell from a modern battery of rapid-fire and automatic guns; as a result of this we see all the later battleships, armored cruisers and protected cruisers increasing the protection of the broadside batteries and exposed gun positions, even at the expense of the water-line belt. It has also been advocated lately to do away entirely with the protective deck, thus gaining many tons weight which

H. P. Cyl. Port Engine of Battleship, Looking Forward.

water-line belt the length of the machinery space only, leaving the ends of the vessel unprotected; this was considered dangerous, however, as penetration at these unprotected ends would probably have serious consequences, so, as armor improved in quality, enabling thinner and therefore lighter plating to be used, the weight so gained was utilized by continuing the protection, at a reduced thickness, all the way to the bow and stern, thus protecting as far as possible the

ENGINES OF THE "WISCONSIN."

CYLINDERS: High Pressure, 33½ inches; Intermediate, 51 inches; Low Pressure, 78 inches; Stroke, 48 inches.
WORKING PRESSURE, 180 pounds to the square inch. **HORSE POWER,** 12,600.

WARSHIPS, MODERN

could possibly be used to better advantage elsewhere. The foregoing description, in a general way, portrays the disposition of armor usually employed on the battleship type, but it may be considered to apply as well to armored cruisers, remembering that in the latter class of vessel the armor is thinner all through. The design and building of battleships shows a constant development. Each new vessel is, in many respects, an improvement on her immediate predecessor; there is some uncertainty, however, as to the best type, due to the fact that there have been no naval engagements, since the modern warship was evolved, of sufficient importance to settle beyond question whether this development is along correct lines or not. The trend of development, however, has been in the following directions: for the battleship, a reduction in the size of the largest guns, made possible by im-

capacity. Captain Walker, U. S. N., has said of the armored cruiser: "Her role . . . is assumed to be that of a vessel possessing in a high degree offensive and defensive qualities, with the capacity of delivering her attack at points far distant from her base in the least space of time." For this statement to apply to the modern armored cruiser, remembering that the ability to fight must be measured by the standard set by the battleship, it should be reversed and the degree should read "moderate" instead of "high." There is no class of warship concerning which there is a greater diversity of opinion. Many eminent authorities hold that the armored cruiser, with a speed enabling her to give or decline combat at will and to overtake protected cruisers and commerce destroyers, with an armament sufficient to ensure the destruction of such vessels when overtaken, and with suf-

4,000 I. H. P. Main Engine of a Destroyer.

provements in material and higher velocity of projectiles; an increase in the size of rapid-fire guns; a much improved quality of armor, with a greater proportion of the ship covered by same; an increase in speed and coal capacity, and a saving in machinery weights due to the introduction of the water tube boiler and to a generally higher grade of material; and finally an increase in size of the whole vessel. For the armored cruiser almost the same advance has been made as in the battleship, and in many respects the armored cruisers are merely battleships somewhat weakened in defensive and offensive qualities to gain a few knots speed.

Armored Cruisers.—The armored cruiser can best be described as a battleship in which the qualities of offense and defense have been much reduced to gain high speed and great coal

sufficient armor to protect her from the guns carried by such ships and possibly sufficient to enable her to engage a battleship under conditions favorable to herself and of her own choosing, adds a very important element of fighting strength to the fleet, and that in this class the requirements of warships are most nearly fulfilled. On the other hand there are many who hold that the armored cruiser is an anomaly, something less than the battleship and more than the protected cruiser, performing satisfactorily the duties of neither, with no special function of her own and lacking the great desideratum in warships, ability to fight in proportion to her great size and cost. With the increase in speed of the battleship until there is only a difference of about 3 knots between its speed and that of the armored cruiser, and this differ-

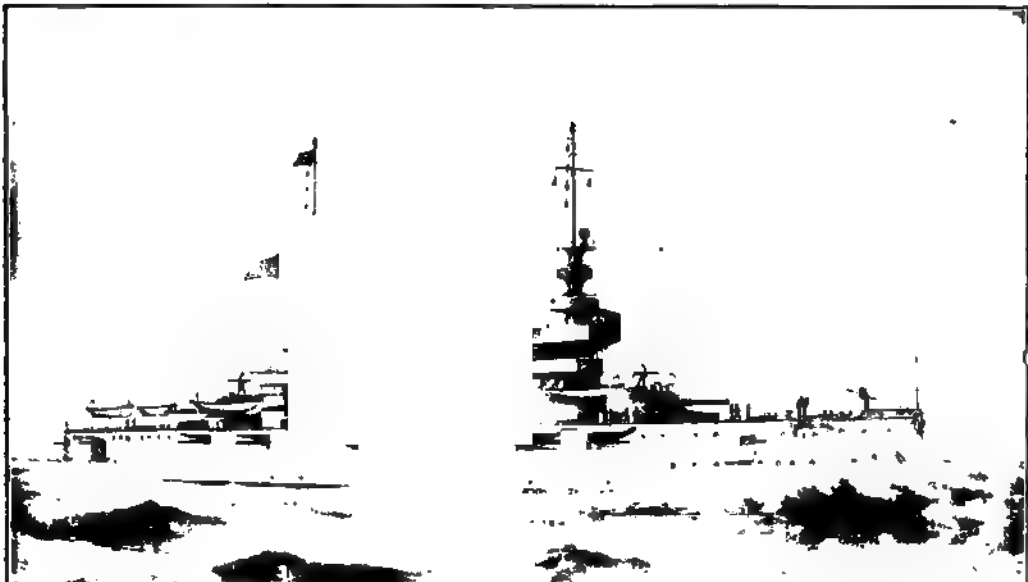
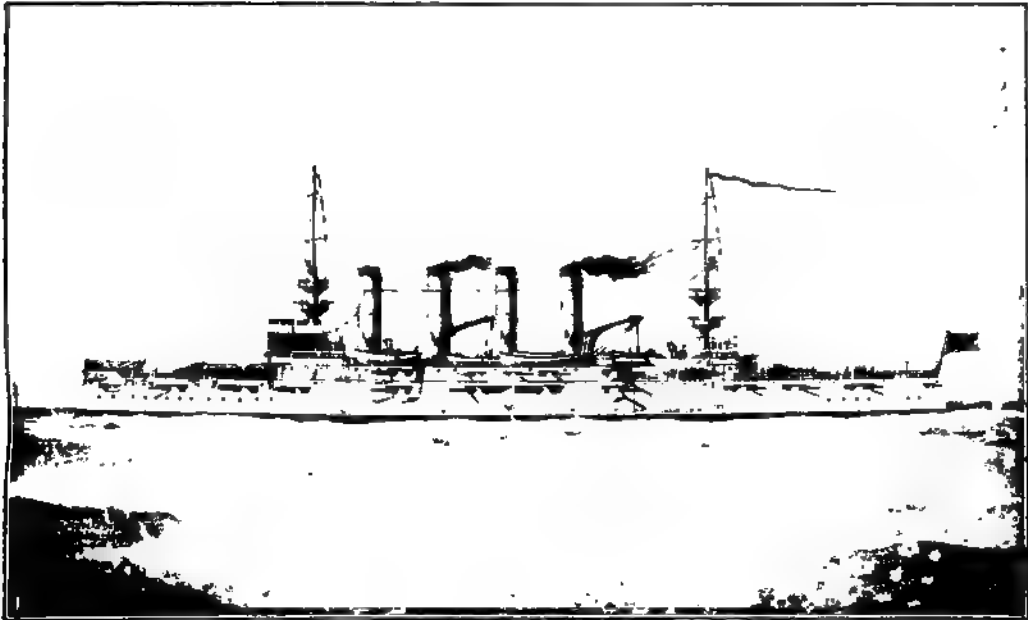
UNITED STATES FIRST-CLASS BATTLESHIPS, 1910.

• **Under construction.**

Date of act authorizing building.

Limit of cost.

MODERN WAR-SHIPS



1. PROTECTED CRUISER "MILWAUKEE," LAUNCHED SEPTEMBER, 1904.

DISPLACEMENT, 2,700 tons. SPEED, 22 knots. FUELER CAPACITY, 1,500 tons. ARMOR, Belt, 4 inches. ARMAMENT: Fourteen 6-inch R. F.; eighteen 3-inch R. F.; twelve 2-pounder semi-automatic; four 1-pounder automatic; two 3-inch field guns; two 0.50-caliber machine guns; eight 0.30-caliber automatics. COMPLEMENT, 645.

2. BATTLESHIP "CONNECTICUT," LAUNCHED SEPTEMBER, 1904.

DISPLACEMENT, 13,000 tons. SPEED, 18 knots. COAL SUPPLY, 2,300 tons. ARMOR, Belt, 11 inches to 4 inches. ARMAMENT: Four 12-inch, eight 8-inch, twelve 7-inch, twelve 3-inch rapid-fire guns, 20 smaller guns. TORPEDO TUBES, 3 submerged. COMPLEMENT, 803.

ence most apparent on the trial trip, as any decrease in efficiency will necessarily be most severe on the faster type, and when this gain of a few knots speed is at such an expense of armor and armament as to practically preclude the armored cruiser from joining battle with the battleship, it hardly seems worth while to put practically the same amount of money into vessels of the weaker type. There is doubtless a large field for the armored cruiser in swift attack upon isolated or unprotected positions, in raids on the trade routes of maritime states or in blockade and many other duties; but, before the end is reached, the enemy's battleship squadron must be met, and this the armored cruiser can not do, at least with much prospect of success. Prophecy is always an uncertain occupation, but judging as well as we can from the present line of advance, it would seem most likely that this debatable question will be met by increasing somewhat the speed and coal endurance of the battleship and reducing slightly her protection at the water-line or possibly in the protective deck, while the armored cruiser reduces her speed somewhat and increases her armor and armament, until the two types merge. Aside from speculation, however, the consensus of opinion seems to be that the more recent armored cruisers in all the great navies are too large. However this may be, the fact remains that, if any one country develops a type of warship having particularly marked characteristics, other nations who wish to remain on a footing of equal strength, must build vessels of the same type to meet them, and all of the more important naval powers are now adding armored cruisers to their fleets. It may be of interest to add that France, at the present time, is building armored cruisers almost to the exclusion of battleships, and it must not be forgotten that the French nation has, on other occasions, inaugurated the line of naval development. The preceding table gives the particulars of battleships and armored cruisers, built and under construction, in the United States navy.

Protected Cruisers.—The protected cruiser class depends for protection upon the protective deck alone. These vessels were very popular in all navies some years ago, and in them everything was sacrificed to what was considered at that time high speed. The Japanese *Naniwa*, 3,650 tons displacement and 18¾ knots, and the Chilean *Esmeralda*, 3,000 tons displacement and 18¾ knots speed, were considered phenomenal vessels and were regarded as models. Owing to the difficulty of a small ship maintaining high speed in anything but the most favorable weather, vessels of this class gradually increased in size until they reached 7,000 or 8,000 tons displacement. Being without any protection save the protective deck, these vessels could be utterly destroyed by the fire of modern rapid-fire guns even though neither their protective decks nor their water-lines were pierced, in fact they were not much better than armed ocean liners. After a few years the armored cruiser came out, immeasurably superior, and naval designers quickly turned to that type. It is probable that the protected cruiser will be modified, and her place taken, as far as speed is concerned, by a new type, just now being developed, the Scout. As its name implies this type will be very fast, 23 to 25 knots, with large coal capacity and no protection. The Scout class is not designed to

fight but rather to act as the eyes of the fleet. They are of good size, 3,000 to 4,000 tons displacement, with fine lines for speed. Their duties will be to discover and keep in touch with the enemy and to carry news to their own battle squadron; they will also be capable of destroying

Torpedo Boat Destroyer.

torpedo craft. As to unprotected cruisers and gunboats, while necessary in times of peace for general police of the seas and to show the flag in foreign ports, they are of no use in battle except against unarmored vessels. A table giving the particulars of the protected cruisers in the United

WARSHIPS, MODERN

States will be seen on two of the foregoing pages.

Monitors.—The monitor is a strictly American type and is dear to the American heart on account of the service the first monitor did the country in the Civil War, by defeating the Confederate armored ram Merrimack, or Virginia as she had been renamed. The monitor, being very low in the water, with her water line heavily armored and her upper deck only three or four feet above the surface, affords a very small target, and that well protected, for an enemy's shot; this same quality, however, makes her a very poor sea-boat as, in bad weather or any sea, her deck is awash and it is impossible to work her guns. For harbor or coast defense, however, the monitor has no superior in the minds of many, and we have recently completed four new monitors for this purpose, the Arkansas, Nevada, Florida, Wyoming. Of course there is more or less discomfort in life on board a vessel of this class, as all living quarters are below the water line and artificial ventilation and light must be used constantly, still it is not as bad as might be expected and one becomes accustomed to the conditions. (On one of the preceding pages may be found a table giving particulars of monitors now in the navy.

Torpedo Boats.—In the torpedo boat we have reached a class of vessel in which there are practically no qualities of defense and in which the weapon of offense has changed from one of precision, the gun, to one of great uncertainty, the torpedo. The torpedo boat depends for success in her attack upon both her small size and her speed, and largely upon the elements of surprise and secrecy; indeed secrecy is vital to her, as discovery means, at the least, failure in her attack, and it is generally admitted that in an attack by a torpedo boat on a warship, say a battleship, if the torpedo boat is discovered in anything like reasonable time her destruction is assured. The rapid-fire and automatic guns discharge such a stream of projectiles that it is highly improbable a torpedo boat, once discovered, could get within range to use her weapon effectively. This virtually precludes all idea of torpedo attack by daylight and even at night the conditions are not all favorable. The torpedo boat when running at high speed rides on the crest of a wave created by herself, and the white spray and foam that accompany this wave are picked up by the battleship's searchlight long before the boat herself can be seen; in addition to this, at high speed her presence is betrayed by flames and sparks pouring from the stacks. On the other hand in thick weather, in rain or in fog, the boat has a good chance against the battleship or cruiser, and the knowledge held by a blockading fleet that a number of torpedo boats were in the shelter of the harbor awaiting an opportunity to attack, could not fail to have a telling moral effect upon their crews and would require the ships being kept in constant motion and moving much farther out to sea at night. Torpedo boats should be small, as the larger the boat the more easily she will be discovered. On the other hand a small boat is unseaworthy, hence there is a natural division into harbor defense and sea-going boats, and roughly speaking a sea-going torpedo boat should not be less than 125 feet long. As boats below this length are too small to keep the sea

for any length of time they must operate from a base of supplies, and this limits them practically to coast defense. The services required of the larger boats, however, are of two kinds: they must be able to make torpedo attacks upon the enemies' vessels and able to protect their own fleet against similar attacks. As has been said before, the construction of one type of vessel with marked characteristics is an incentive to the development of another type to destroy her. Just as the armored cruiser was evolved to destroy the swift protected cruiser so has the torpedo boat destroyer, commonly called the "destroyer," been evolved to meet and destroy the largest and fastest torpedo boats. Of larger size and therefore more seaworthy, with a stronger armament and greater coal capacity and speed, and therefore the superior of the torpedo boat in every respect, with the same outfit of torpedoes as the boat and therefore just as dangerous to an enemy, the destroyer promises to drive out the torpedo boat type for everything except harbor defense, just as the armored cruiser shows signs of driving out the protected cruiser type. A comparison of what may be considered standard torpedo boats of the three types is given in the following table:

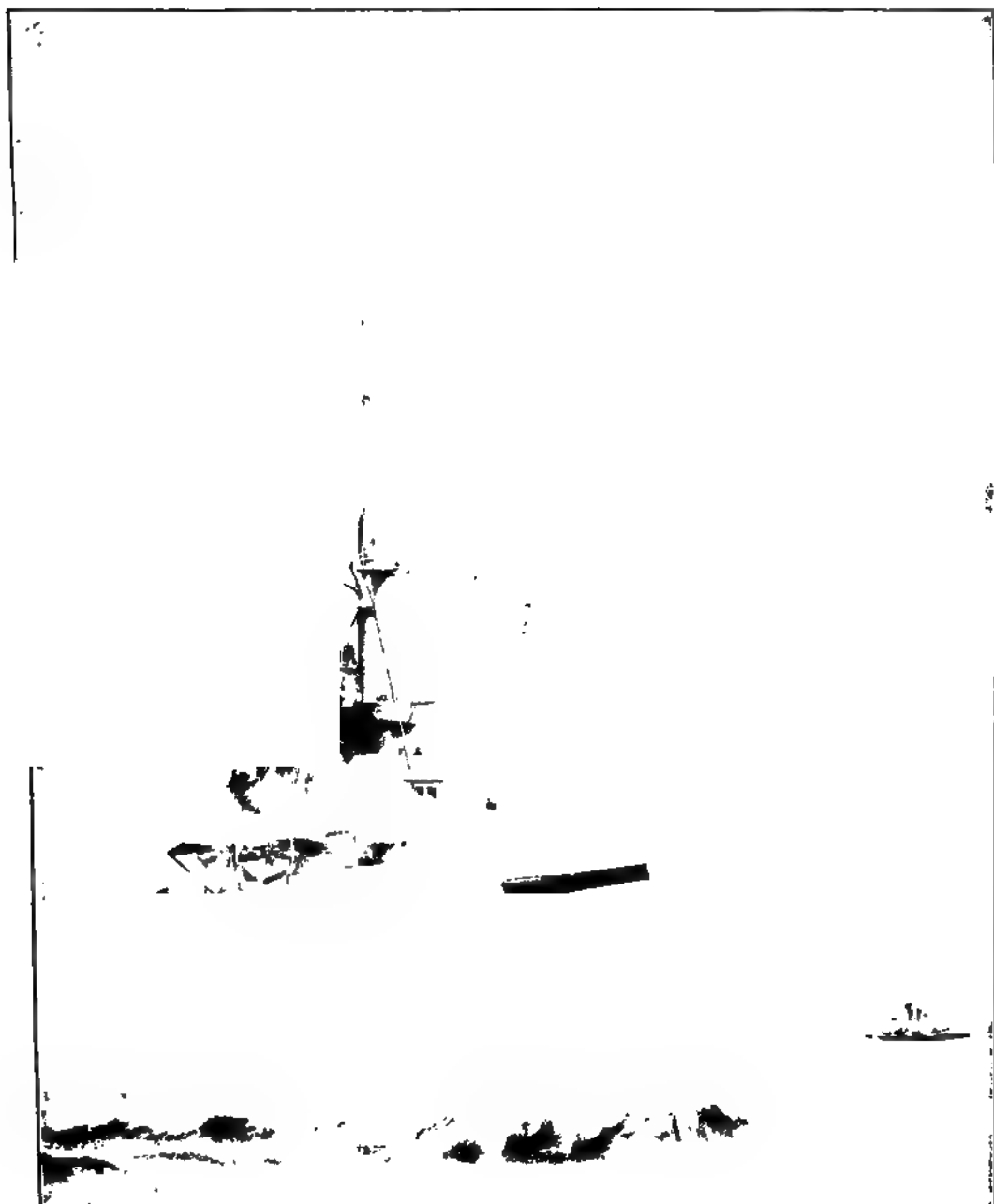
	Harbor defense boat	Sea-going boat	Destroyer
Length	99' 6"	138' 9"	248'
Beam	12' 6"	14' 3"	23' 3"
Draft	3' 3"	4' 11"	8' 6"
Displacement, tons	45.78	105	435
Speed: Knots per hour ..	20.8	22.5	29.84
Indicated horse-power	850	1,720	8,300

It is usual for maneuvering purposes and as a precaution in case of accident, to make nearly all torpedo boats of the three types with twin screw, though some foreign navies, noticeably the German, make many single-screw boats. As in most other types the tendency here is in the direction of too high speed. Most authorities agree that 25 knots is enough for a torpedo boat and 28 knots enough for a destroyer; this is speed sufficient for all practical purposes and the weight saved can be put into the main engines, which are of necessity extremely light and therefore liable to break down. The destroyer type is quite seaworthy and is capable of accompanying the fleet, provided means is at hand for replenishing the coal and store supply. This country has not gone into the construction of torpedo boats and destroyers as extensively as most of the other powers, as is shown in the following table:

	U. S.	England	France	Germany	Russia
First class torpedo boats.	35	117	176	203	98
Destroyers	16	130	43	39	54

The detailed particulars of United States destroyers and torpedo boats are given in preceding tables.

The following table gives the total number of steel and iron steam vessels and other craft of the United States navy, with their displacement. It also indicates the number of vessels fit for service and those under construction or authorized 30 June 1910:



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ADMIRAL TOGO'S FLAG-SHIP MAKASA IN ACTION

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WART — WARTHE

Class	Number fit for service	Displacement	Number authorized and under construction
First-class battleships....	20	406,146	6
Second-class battleships....	1	6,315	...
Armored cruisers.....	12	157,445	...
Single-turret monitors....	4	12,900	...
Double-turret monitors....	6	26,104	...
Protected cruisers.....	23	103,170	...
Unprotected cruisers.....	11	6,216	...
Scout cruisers.....	3	11,350	...
Gunboats.....	9	11,564	2
Light-draft gunboats.....	3	4,153	...
Composite gunboats.....	6	8,190	...
Special class.....	2	2,416	...
Gunboats under 500 tons....	12	3,095	...
Torpedo-boat destroyers....	21	10,195	21
Torpedo boats.....	14	5,330	...
Submarine boats.....	18	3,485	28
Iron cruising vessels.....	3	3,050	...
Wooden vessels.....	9	13,360	6
Auxiliary cruisers.....	5	28,339	...
Converted yachts.....	19	10,421	...
Colliers.....	20	135,417	...
Miscellaneous.....	65	20,968	6
Total.....	308	1,067,537	69

Naval authorities disagree as to the relative positions of the United States and other Powers in their naval strength. Pulsifer in the 1910 *Naval Year Book* gives the United States second place in vessels strength, with Great Britain first and Germany third. In the official table of sea strength prepared by the office of Naval Intelligence of the Navy Department, Germany is put in second place and the United States is third. See also TORPEDO BOATS.

Bibliography.—'Journal of the American Society of Naval Engineers'; United States Naval Institute; 'Naval Annual'; Brassey, 'The Fleet Today'; 'Mechanism of Warships'; Journal of the Royal United Service Institute; 'Steam Navy of the United States'; 'Transactions' of the Society of Naval Architects and Marine Engineers.

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Wart, an elevation on the skin, usually a collection of lengthened papillæ, closely adherent, and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air the surface presents a horny texture, and is rounded off into a small button-like shape. Simple warts are commonly seen on the hands and fingers (rarely on the face or elsewhere) of persons of all ages, but especially of children. Among other varieties of warts are: (1) the verruca digitata, more elongated in shape and less protected by cuticle than the common wart, and which is apt to occur on the scalp, especially in persons of adult age, and sometimes occasions great annoyance in brushing and combing the hair; (2) subungual warts, generally of syphilitic origin, growing, as their specific name implies, beneath or at the side of the finger or toe nail, and which originate beneath the nail, as they increase crop out either at the free extremity or the side of the nail, and are usually troublesome, often very painful; (3) venereal warts, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. These last attain a larger size, and are more fleshy and vascular than other warts. It is supposed that warts are always due to some local irritation. Venereal

warts are certainly contagious; with regard to others, nothing can be said positively on this point. In consequence of the capricious way in which warts often undergo spontaneous cure, there are numerous popular "charms" for their removal. Common warts are so apt to disappear that they may be often left to themselves. If it is desired to remove them, glacial acetic acid may be applied with a camel's hair pencil till the wart is pretty well sodden, care being taken not to blister the neighboring skin. One or at most two applications will usually be sufficient. Nitrate of silver and tincture of iron are popular and general applications. Salicylic acid in collodion is also very effective. Small warts hanging by a neck may often be very simply removed by the tight application of an elastic ligature to the base. The wart usually shrivels up and falls off within a week. Electrocautery is sometimes successfully employed. The other varieties must be left to the surgeon.

Wart-hog, an extraordinary African swine, several species of which form the genus *Phaco-chærus*, and are so named from the presence of a large warty protuberance on each cheek. The *P. alicani* of Northern Africa is familiar in Abyssinia under the names of halluf or Haroja. Another species is the vlakke vark (*P. ethiopicus*) of Dutch South Africa, which, like the preceding form, has formidable tusk-like canines and a large wart under each eye. The animal attains a length of 3 or 4 feet, and is reddish-gray with a stiff blackish mane and spinal stripe. It is fierce and courageous and fights desperately when brought to bay.

Warta, vârtă. See WARTHE.

Wartburg (vârt'boorg) Castle, an ancient mountain castle of Germany, not far from Eisenach, belonging to the Grand Duke of Saxe-Weimar. It was built between 1069 and 1072, and was the residence of the landgraves of Thuringia. The elector Frederick the Wise of Saxony caused Luther, who had been outlawed by the Diet of Worms, to be carried thither, where he lived from 4 May 1521 to 6 March 1522, engaged in the translation of the Bible. See LUTHER, MARTIN.

Wartburg, War of the, the name given to a great poetic contest which took place in 1206 or 1207, when the minnesingers assembled at the Wartburg, Germany, for a trial of their skill before Hermann I., landgrave of Thuringia. The poem descriptive of the contest was entitled *Krieg von Wartburg*, and appeared about 1300. It is a singular, wild, and inharmonious composition, divided into two parts, and its authorship is unknown. The Wartburg festival was a celebration held at the castle by German students on 18 Oct. 1817, in the third centenary year of the Reformation. Several hundred students from 12 universities were present, and here the colors of the student societies were displayed for the first time. The participants in the festival were suspected of an intention of introducing republicanism into Germany, and after the assassination of Kotzebue a large number of them were arrested and imprisoned, and not long afterward all participation in the student societies was forbidden by the authorities.

Warthe, vârtě, or **Warta**, a European river, the principal tributary of the Oder River. It rises near Kromolov, Russian Poland, and

WARTON

After a northern and western course, enters Prussia at the confluence of the Prosna. It flows westerly and empties into the Oder at Küstrin. Its total length is 487 miles.

Warton, Joseph, English poet and critic: b. Dunsfold, Surrey, 1722 (baptized 22 April); d. Wickham, 23 Feb. 1800. He was the son of Thomas Warton the elder, and brother of Thomas Warton the younger (q.v.). He studied at his father's grammar school at Basingstoke; then at Winchester; and finally at Oriel College, Oxford, where he was graduated B.A. 13 March 1743-4. During the next ten years, he served successively as curate at Basingstoke, Rector of Winslade, and Rector of Tunworth. Then, in 1755, he became usher, or second master, and in 1766 headmaster, of Winchester College. In 1759, he had received from Oxford the degree of M.A.; in 1768 he received those of B.D. and D.D. He remained at Winchester 38 years; but, after suffering three student insurrections, he resigned in 1793 and withdrew to a living at Wickham. There he died, 23 Feb. 1800.

Among English writers of the 18th century, Joseph Warton is significant for being probably the earliest consciously romantic poet. The romanticism evident in his hostility to the cold correctness of the school of Pope, and in his enthusiasm for Spenser, Shakespeare, and Milton, appears consistently throughout his works. It appears in 'The Enthusiast; or the Lover of Nature,' written in 1740 when Warton was eighteen and included in his first volume 'Ode on reading West's Pindar' (1744).

What are the lays of artful Addison,
Coldly correct, to Shakespeare's warblings wild?
Whom on the winding Avon's willow'd banks
Fair Fancy found, and bore the smiling babe
To a close cavern.

His Romanticism he again avows in the advertisement to his second volume 'Odes on Various Subjects' (1746): "The Public has been so much accustomed of late to didactic poetry alone, and essays on moral subjects, that any work where the imagination is much indulged, will perhaps not be relished or regarded. The author therefore of these pieces is in some pain lest certain austere critics should think them too fanciful or descriptive. But as he is convinced that the fashion of moralizing in verse has been carried too far, and as he looks upon invention and imagination to be the chief faculties of a poet, so he will be happy if the following Odes may be looked upon as an attempt to bring back Poetry into its right channel." This romantic creed he states even more completely in his 'Essays on the Genius and Writings of Pope' (1757). This book has been called the "most important of all the critical works that aided the Romantic movement . . . one of the most significant books of the whole century." In it, Warton openly attacked the poetry of Pope; demolished the ideals of the pseudo-classical school, and in their place set up the romantic standards that have since been accepted. It makes Warton, despite the comparative inconsequence of his poetry, one of the most important forerunners of English Romanticism.

His chief works are: 'Ode on Reading West's Pindar' (1744); 'Odes on Various Subjects' (1746); an edition of Virgil in Latin and English, to which he contributed translations of the Eclogues and the Georgics (1753), twenty-four essays, chiefly in literary criticism, contributed to 'The Adventurer' (1753-6); 'Essays on the Genius and Writings of Pope' (vol. I, 1757; vol. II, 1782); and an edition of Pope's works in nine volumes (1797).

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Warton, Thomas, English writer: b. Basingstoke, 9 Jan. 1727-8; d. Oxford, 21 May 1790. He was the younger son of Thomas Warton, and brother of Joseph Warton (q.v.). He studied under his father until, at the age of sixteen, he matriculated, 16 March 1743-4, at Trinity College, Oxford. With this university he was associated for life. Here he received his B.A. in 1747; took orders; became a tutor; received the degree of M.A. in 1750, a fellowship in 1751, and the degree of B.D. in 1767. For two terms of five years each, beginning in 1757, he was professor of Poetry; and in 1785 he was appointed Camden Professor of History at Oxford, and Poet Laureate. In 1771, he was made a fellow of the London Society of Antiquaries; and from 1782 he was, like his brother Joseph, a member of Dr. Johnson's Literary Club.

Warton's significance in English literature consists in the influence that he exerted in favor of the romantic revival in the 18th century. In his 'Observations on the Faerie Queen of Spenser' (1754), in his critical edition of Milton's early poems, and especially in his great 'History of English Poetry' (1774-81), he demonstrated to all who could understand, that English poetry did not begin with Dryden, and that it might rightfully deal with subjects other than those chosen by the Queen Anne wits. His 'Observations on the Faerie Queen' is a strong plea for romanticism and for a study of Spenser, of chivalry, and of mediæval life. His 'History of English Poetry' embodies, in the clear prose style of Warton's day, a knowledge, rare even in our own, of English poetry from the close of the eleventh century to the end of the Elizabethan period. Later scholarship has discovered in Warton's 'History' some errors of detail; but it remains, nevertheless, a monument of wide reading and profound research. In addition to these historical and critical works, Warton promoted the romantic movement by his experiments in the verse-forms and subject-matter of Spenser and Milton. Notable among his imitations of the latter are his sonnets, his ode on the 'Approach of Summer,' and his 'Pleasures of Melancholy.'

His chief works are: 'The Triumph of Isis' (1749); 'Newmarket, a Satire' (1751); a humorous 'Guide' to Oxford (1760); an anthology of university wit entitled 'The Oxford Sausage' (1764); 'Observations on the Faerie Queen of Spenser' (1754); 'History of English Poetry from the Close of the 11th to the commencement of the 18th Century' (vol. I, 1774; vol. II, 1778; vol. III, 1781; vol. IV, never published); 'Poems . . . by John Milton . .

WARWICK — WASECA

with Notes Critical and Explanatory . . . (1785); a collection of his own poems (1777); fourth edition (1780); and another edition, corrected by himself before his death (1791).

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Warwick, wôr'k. Guy. See **GUY OF WARWICK.**

Warwick, Richard Neville, EARL OF, English soldier and statesman, known as the "King-maker" b. about 1428; d. Barnet, Hertfordshire, 14 April 1471. In the battle of St. Albans (1455), the opening action of the Wars of the Roses, he fought on the Yorkist, the winning side, and three years later as lord-deputy of Calais and admiral of the fleet gained a splendid success over the Spaniards, but a quarrel between his followers and those of the king led to charges against him which resulted in his taking the field of Ludlow with his cousin, the Duke of York (1459). On being defeated, he withdrew to Calais, and thence in the following summer retreated to Kent, and, mastering London, brought about the compromise by which Henry VI. was to reign for life, but York was to be recognized as his successor. Thereupon Margaret of Anjou, routing and slaying York and Salisbury at Wakefield, advanced to St. Albans, where a second battle ended in Warwick's defeat. Warwick, however, joined the young Earl of March (now Duke of York), and boldly placed him on the throne as Edward IV., then chasing the Lancastrians back to Yorkshire, cut them to pieces on the field of Towton 29 March 1461. Warwick, however, bestowed his daughter on the Duke of Clarence, and after seizing on Edward's person, executing the queen's father and brother, entered upon a scheme for making Clarence king.

Failure drove him once more to France, where, through the mediation of Louis XI., he engaged to restore the crown to Henry VI., with the understanding that Margaret wed her son to Warwick's daughter Anne. His landing in Devonshire came like a clap of thunder to Edward IV., who from the North, where he was busy quelling a revolt, escaped to Burgundy, leaving Warwick master of the kingdom. Edward returned in six months' time, and Warwick with his brother was routed and slain at Barnet 14 April 1471.

Warwick, England, a market-town, capital of Warwickshire, on the right bank of the Avon, 90 miles northwest of London. The principal buildings are the Church of St. Mary, the Earl of Leicester's hospital for aged brethren, the shire-hall, jail, museum, endowed grammar school, east and west gates, etc. The chief manufacture is gelatine; and the trade in cattle, corn, and provisions is considerable. On the opposite bank of the river, crowning a solid rock, is the ancient and magnificent castle, the residence of the earls of Warwick. The date of the original erection is unknown. Caesar's Tower, the most ancient part of the structure, is 147 feet high; Guy's Tower, 128 feet high, was erected in 1304. The approach to the grand front exhibits three stupendous towers, and the entrance is flanked with embattled walls covered with ivy. It was partially destroyed by fire in 1871; but the most ancient portion remains uninjured.

Warwick, N. Y., village in Orange County; on the Wawayanda Creek, and on the Lehigh & Hudson River Railroad; about 30 miles southwest of Newburgh and 10 miles south of Goshen. It is in an agricultural region, and near by are iron mines and granite quarries. In the vicinity are the beautiful lakes, Glennere, Greenwood, Clark's, and Wawayanda. The manufacturing establishments are railroad shops, a foundry, creameries, and fabric-hose works. It has six churches, Warwick Institute, graded schools, and a school library. There are two banks; the national has a capital of \$100,000 and deposits \$267,920. The Warwick Savings bank has deposits amounting to over \$1,000,000. The village is a favorite summer resort. Pop. (1910) 2,318.

Warwick, R. I., town in Kent County; on the Pawtuxet and the Providence rivers, the Cowsett and Narragansett bays, and on the New York, New Haven & Hartford Railroad. It is 5 miles south of Providence. It has extensive manufacturing interests; the chief industrial establishments are cotton mills, flour and grist mills, foundry and machine shops, and blacksmith and wheelwright shops. The government census of 1900 gives the number of manufacturing 104, which were capitalized for \$2,418,333, and which had 5,544 employees, who received annually \$1,852,462. The raw material cost, each year, \$2,522,789, and the products were valued at \$6,197,506. The town includes several villages, in each one of which there are graded schools, and in some libraries. Warwick was settled in 1642 by a colony of 12 Englishmen, under the leadership of Samuel Gorton. The place was first called Shawomet; but in 1848 the name was changed by admirers of the Earl of Warwick. Massachusetts claimed control of the colony, and in 1643 one result of the contentions was that the place was nearly destroyed. Indians attacked the place several times, and, in 1676, burned a number of houses and wounded many of the defenders of the town. Nathaniel Greene (q.v.) was born in Warwick. Pop. 1890 17,761; (1900) 21,316; (1910 census) 26,629.

Wasco (wâ'skô) Indians ("grass," or "grass people"), a tribe of the Chinookan stock of North American Indians, also known as Dalles Indians and as Wascopums. They formerly claimed the country about The Dalles, on the south bank of Columbia River, in Wasco County, Oregon, therefore forming, with the Wushum or Tlagluit, the easternmost extension of the Chinookan stock. They were participants in the Wasco treaty of 1855 and are now on Warm Springs Reservation, Oregon. Pop. about 290.

Waseca, wâ-sê'kâ, Minn., city, county-seat of Waseca County; on Clear Lake, and on the Minneapolis & Saint Louis and the Chicago & Northwestern R.R.'s; about 60 miles south by west of Minneapolis and 25 miles south by east of Mankato. It is in an agricultural and stock-raising region. It has flour mills, creameries, and machine shops. The Minnesota Chautauqua holds its sessions on their grounds bordering on the lake, and adjoining the city. There are 12 churches, the Holy Child Jesus Academy, graded public schools, and a school library. Pop. (1910) 3,054.

WASH—WASHBURN

Wash, England, a wide estuary on the east coast, between the counties of Lincoln and Norfolk, 22 miles in length and 15 miles in average breadth. It is surrounded by low and marshy shores, and receives the Witham, Welland, Ouse, Nen and Nar rivers. The estuary for the most part is occupied by sandbanks, dry at low water, and intersected by channels through which the rivers flow into the North Sea. On both sides of the channel by which the Ouse falls into the sea considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn Deep, opposite the Norfolk, and Boston Deep, off the Lincoln coast.

Wash Bottle, in analytical chemistry, an apparatus used for delivering a fine jet or stream of liquid on to a precipitate for the purpose of washing it, or for removing any residue of a solution or solid particles from one vessel to another. It consists of a flask of hard glass, fitted with a cork or india-rubber stopper perforated in two places. Through each perforation is passed a piece of bent glass tubing, one being carried to within half an inch of the bottom of the flask, and the portion of tubing outside drawn to a fine open point. The other tube is carried just within the bottle, and it is to the outer end of this that the lips are applied in blowing into the apparatus in order to expel the liquid contained in it.

Washburn, wôsh'bérn, Cadwallader Colden, American soldier, son of Israel Washburn (q.v.): b. Livermore, Maine, 22 April 1818; d. Eureka Springs, Ark., 14 May 1882. He studied law, was admitted to the bar in 1842, and engaged in practice at Mineral Point, Wis. He founded a bank there in 1852, dealt extensively in real estate, and in 1855-61 was a member of Congress. At the outbreak of the Civil War he organized a cavalry regiment, of which he was appointed colonel. He was engaged in the Arkansas campaign, received his commission as major-general of volunteers in 1862, participated in the movements around Vicksburg, and later was assigned to command the 13th Corps in the Department of the Gulf. He was transferred to Texas with a portion of his command in 1863, captured Fort Esperanza, 29 Nov. 1863, and in 1864 was placed in command of the district of West Tennessee. He was again member of Congress in 1867-71, was governor of Wisconsin in 1871-3, and subsequently engaged in lumber and flour manufacturing. He founded the Washburn Observatory at the University of Wisconsin.

Washburn, Charles Ames, son of Israel Washburn (1784-1876) (q.v.), American editor and diplomat: b. Livermore, Maine, 16 March 1822; d. New York 26 Jan. 1889. He was graduated at Bowdoin in 1848, went to California in 1850, entered journalism in San Francisco, and became editor and proprietor of the *Alta California*, the first newspaper on the Pacific coast to advocate the principles of the Republican party, of which he was one of the organizers in that State. From 1858 to 1861 he was editor and proprietor of the *San Francisco Daily Times*. In 1860 was chosen elector at large, and in the following year was appointed by President Lincoln minister to Paraguay, a post which he occupied for seven years, covering most of the

period of the war between that country and Brazil and her allies. In 1868, under the tyranny of Francisco Solano Lopez (q.v.) many foreigners, as well as Paraguayans, were put to death on an unfounded charge of conspiracy against the government, and Washburn, on account of his efforts to save the lives of his associates, was accused of complicity in the plot. His life was preserved through the intervention of a United States naval force, the gunboat *Wasp* taking him away from the country. Disagreement with certain naval officers grew out of these incidents, and the circumstances were investigated by the House Committee on Foreign Affairs. The result was Washburn's complete vindication. He published a 'History of Paraguay, with Notes of Personal Observations and Reminiscences of Diplomacy under Difficulties' (1871), giving a graphic account of these events; 'From Poverty to Competence'; 'Graduated Taxation'; 'Political Evolution'; and several novels. He was the inventor of a typograph and other mechanical devices.

Washburn, Emory, American jurist: b. Leicester, Mass., 14 Feb. 1800; d. Cambridge, Mass., 17 March 1877. He entered Dartmouth College, and from there went to Williams, where he was graduated in 1817. Admitted to the bar in 1821, he practised in Leicester until 1828, and for the next 30 years in Worcester. Having served in both branches of the Massachusetts legislature, in 1844 he became a justice of the court of common pleas, a position which he held three years. In 1854-5 he was governor of the State. From 1856 to 1876 he served as Bussey professor in the Harvard Law School. Besides lectures, pamphlets, etc., his legal publications include 'American Law of Real Property' (1860); and 'American Law of Easements and Servitudes' (1863).

Washburn, George, American educator: b. Middleboro, Mass., 1 March 1833. He was graduated from Amherst in 1855 and from Andover Theological Seminary in 1859. He was appointed professor of philosophy at Robert College, Constantinople, Turkey, in 1868; served as acting president there in 1870-7; and since the last named year has been president of the college. He is an authority on the politics of Southeastern Europe and in recognition of his services in behalf of Bulgarian liberty and the general elevation of the people he received from the first Bulgarian Parliament a vote of thanks, and in 1884 from the Prince of Bulgaria, the Order of Saint Alexander. He delivered an address on Mohammedism at the World's Parliament on Religions at Chicago in 1893, has been for 20 years a contributor to the London 'Contemporary Review,' and also to other English and American periodicals.

Washburn, Israel, American shipbuilder and trader: b. Raynham, Mass., 18 Nov. 1784; d. Livermore, Maine, 1 Sept. 1876. In 1806 he removed to Maine, then a part of Massachusetts, and having a population of about 200,000. Two years later at a place then called White's Landing (now Richmond), on the Kennebec River, he began shipbuilding in partnership with Barzillai White, and in 1809 established a trading-post at Livermore (now in Androscoggin County), where he soon after settled. He reared many children and several of

WASHBURN—WASHBURN COLLEGE

his sons rose to positions of distinction, making the family name conspicuous in American history.

Washburn, Israel, Jr., American lawyer and "War Governor," son of the preceding: b. Livermore, Maine, 6 June 1813; d. Philadelphia 12 May 1883. He studied law, was admitted to the bar in 1834, and in the same year settled at Orono, Maine, where he practised his profession continuously until 1850, when he was elected to Congress. He was four times re-elected, and became prominent among the anti-slavery members of the House in the critical period just before the Civil War. In 1860 he was elected governor of Maine. Re-elected in 1861, he declined a third election, and in 1863 accepted an appointment as collector of customs for the port of Portland, an office which he continued to hold until 1877. During his terms as governor he energetically supported the Federal government by raising, equipping and forwarding troops with a promptness which insured to Maine an honorable position among the States that upheld the Union cause, and placed his own name in the list of great "War Governors" of the period. In 1875 he was elected to the presidency of Tufts College, but declined the office. He published 'Notes, Historical, Descriptive, and Personal, of Livermore, Maine' (1874), and also contributed frequently to periodicals.

Washburn, Samuel Benjamin, American naval officer, son of Israel Washburn (1784-1876) (q.v.): b. Livermore, Maine, 1 Jan. 1824. He became a shipmaster in the merchant marine, and later engaged in the lumber trade in Wisconsin. During the Civil War he entered the United States naval service as a volunteer, and at the battle of Fort Darling won special commendation for skill and gallantry. Later he commanded a squadron and performed many valuable services for the government.

Washburn, William Drew, American legislator and manufacturer, son of Israel Washburn (q.v.): b. Livermore, Maine, 14 July 1831. He was graduated at Bowdoin in 1854, admitted to the bar in 1857, and in that year engaged in law practice in Minnesota. He was a member of the Minnesota legislature in 1859 and in 1871; was surveyor-general in 1861-5; served in Congress in 1870-85; and in 1880-95 was a United States senator. He engaged extensively in the lumber and flour industries, was one of the builders of the Minneapolis and Saint Louis railroad, of which he was president until 1889. He later became president of the Bismarck, Washburn and Great Falls Railroad Company.

Washburn, Maine, town in Aroostook County; on the Aroostook River; 50 miles north by west of Houlton. It is a distributing centre of considerable importance, although it is eight miles from a railroad station. It is a favorite summer resort. It has three churches, a high school, graded school, and public library. Pop. (1910) 1,582.

Washburn, Wis., city, county-seat of Bayfield County; on Lake Superior, and on the Northern Pacific and the Chicago, St. P., M. & O. R.R.'s; about 50 miles east of Superior, and 200 miles northeast of Minneapolis, Minn. In 1665 a Jesuit mission was established in the place now occupied by the city. Washburn's

first permanent settlement was made in 1883, and in 1884 it was incorporated. In the vicinity are brownstone quarries, and in the forests there is considerable lumbering. There are nearly 2,000 employees in the industrial establishments. Washburn ships large quantities of stone, lumber, and grain; and distributes to the lumber camps and the towns and hamlets of the vicinity general merchandise. There are several church buildings, the county court-house, which cost \$50,000, and several good business blocks. The educational institutions are the Walker High School, founded in 1889 (building cost \$40,000), three graded schools, one large Roman Catholic parish school, and a school library. The two banks have a combined capital of \$50,000. The majority of the inhabitants are Scandinavians. Pop. (1910) 3,830.

FRED T. YATES,
Editor 'News.'

Washburn College, located at Topeka, Kan. It was founded in 1865 by the General Association of the Congregationalists of Kansas, but is non-sectarian in policy and government. It was first called Lincoln College, and the name changed in honor of Ichabod Washburn of Worcester, Mass., who gave the college \$25,000. The college is co-educational. The course of study was at first not above the academic grade, but was soon expanded to a full college course, and other departments added until the college now includes five departments: (1) the College; (2) the School of Medicine, founded as the Kansas Medical College in 1890 and made a department of Washburn in 1902; (3) the School of Law, opened in 1903; (4) the School of Fine Arts; (5) the Washburn Academy. The college confers the degrees of B.A. and B.S. for the completion of a four years' course, and the degrees of M.A. and M.S. for graduate work. For the bachelor degrees the course in the first two years is partially prescribed and partially elective, for the last two years entirely elective; the electives for the Junior and Senior years are divided into three groups, (1) language and literature, (2) mathematics and science, (3) history, philosophy, and social science. One of these groups must be elected as a major department, candidates for the B.S. degree must elect the mathematic and science group. Biblical literature, Hebrew, and pedagogical courses are included in the curriculum. The School of Medicine offers a four years' course leading to the degree of M.D., it is the only school in the State associated with the American Association of Medical Colleges. The School of Law offers a three years' course and confers the degree of LL.B. The School of Fine Arts was organized as a separate school in 1902, music and art departments having been established some years before. This school includes the departments of music, drawing, and painting (including the Reid-Stone School of Art), and oratory. The music department offers four years' collegiate courses in pianoforte, organ, violin, and vocal culture, leading to the degree of bachelor of music; and a two year normal course for public school teachers; there are also four years' courses in drawing and painting leading to the degree of bachelor of painting, and in oratory leading to the degree of bachelor of oratory. The students maintain four literary societies, two for men

WASHBURN — WASHINGTON

and two for women, an oratorical association, Christian associations, and an athletic association. In addition to the intercollegiate sports in which the college participates, an annual college field-day has been inaugurated. The college occupies a campus of 160 acres just outside the city on elevated ground; the buildings include Rice Hall (originally Science Hall, the name being changed in 1902), Whitin Hall, the observatory building (erected in 1903 for the departments of physics and astronomy), the MacVicar chapel, the Boswell Memorial Library, Hartford Cottage and Holbrook Hall (women's dormitories). In 1904 a new library building, the gift of Andrew Carnegie, was in process of construction. The library in 1910 contained 18,000 volumes; in addition the schools of law and medicine have separate libraries; and the Topeka Public, the Kansas State, the Kansas State Historical Society, and the Academy of Science libraries are open to students. In 1910 the students numbered 811. They were about evenly divided between the regular college, the School of Fine Arts, and the School of Medicine.

Washburne, Elihu Benjamin, American diplomat, son of Israel Washburn (q.v.): b. Livermore, Maine, 23 Sept. 1816; d. Chicago, Ill., 22 Oct. 1887. He was educated at Harvard, admitted to the bar in 1840, and engaged in practice at Galena, Ill. He was a member of Congress from 1852-59, when he was appointed secretary of state by President Grant, an office he soon afterward resigned in order to become minister plenipotentiary to France. He was the only foreign minister to remain at his post in Paris throughout the Franco-Prussian war, and the American legation became a refuge for Germans and other foreigners unable to leave the city during the siege of the city and the period of the Commune. His firmness in his course won the gratitude of the European governments and he was granted special honors by the German emperor and Bismarck, as well as by the French leaders, Gambetta and Thiers. He returned home in 1880. He published 'Recollections of a Minister to France' (1887).

Washing of Feet. See **FEST WASHING**.

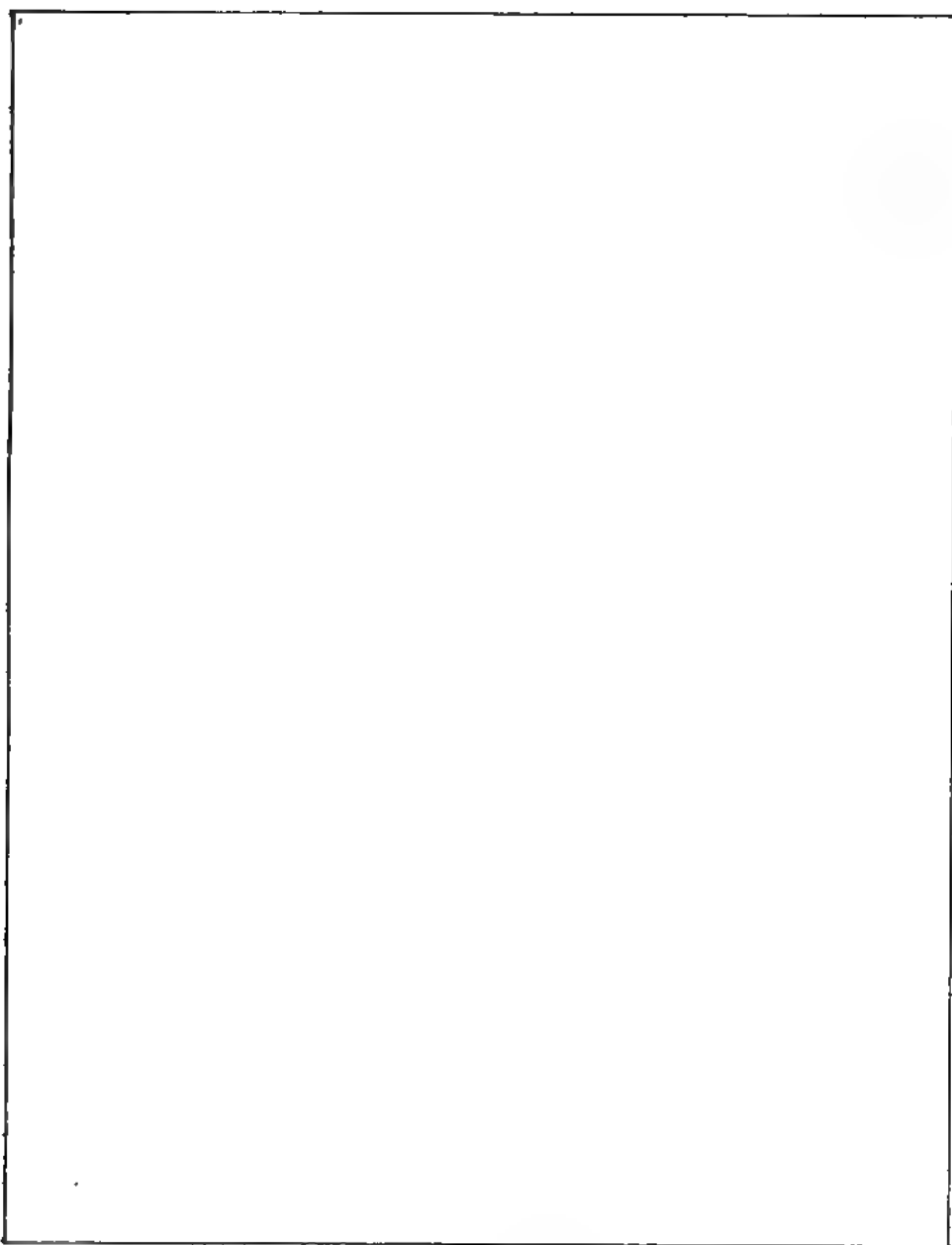
Washing Machine, a machine for washing clothes. A great number of machines have been contrived, the most general feature of them being that the clothes are agitated by artificial means in a vessel or trough containing the cleansing agents. One of the great advantages of the washing-machine as compared with the hands is, that the water can be used when boiling hot. In some, provision is made for retaining the steam, which effectually bleaches the clothes, and they generally have also roller attachments for wringing and mangling.

Washington, wōsh'ing-tōn, **Booker T. Washington**, American negro educator: b. near Hale's Ford, Franklin County, Va., about 1858. After the Civil War he went to Malden, W. Va., where he worked first in a salt-furnace and afterward in a coal-mine, obtained some rudiments of education in a night-school there, and finally after many difficulties, recounted in the autobiography 'Up from Slavery' (1901), got to the Hampton Normal and Agricultural Institute (Va.) (q.v.), where he studied in 1872-5. After a two-years' interval of teaching at Malden, he obtained further training at

the Wayland Seminary (Washington, D. C.), and in 1879 was made an instructor at Hampton. He had charge of the work of the Indian pupils then being experimentally introduced into the institution, and established the night-school as a regular and successful feature of the institute. In 1881 he was selected by General S. C. Armstrong of Hampton on the application of citizens of Tuskegee, Ala., to start in that place an institution on the plan of Hampton. The State legislature granted an appropriation of \$2,000 annually for the salaries of the teaching force, but the Tuskegee Normal and Industrial Institute (q.v.) then existed in name only, without land, buildings, or credit. Washington, with himself as the only instructor, opened the school with an enrollment of 30 in an old church and a shanty. Later he purchased a plantation about a mile from Tuskegee, and removed the school thither to its present site. In 1902 the institution had 112 officers and instructors, 1,384 students, and an income of \$341,000. Its development was due chiefly to the activity of Washington in bringing the nature and merits of the work to public attention, and the originality and effectiveness of his methods. He has aimed to give the blacks a practical education along lines of trade and industry, leading to an ultimate position of economic independence in the South. If this were attained, he asserted, political rights now denied would not long be withheld. He became well known as a forceful public speaker, his most noteworthy address probably being that given in 1895 at the opening of the Cotton States and International Exposition in Atlanta, Ga. He organized the National Negro Business League at Boston in 1900. Among his writings are: 'The Future of the American Negro' (1899); 'Up from Slavery' (1901), the interesting autobiographical narrative referred to above; and 'Character-Building' (1902), collected addresses to pupils of Tuskegee. Consult further M. B. Thrasher, 'Tuskegee' (1900), to which Washington contributes an introduction; and an article by W. D. Howells in the 'North American Review,' Vol. 173, pp. 280-8 (1901).

Washington, Bushrod, American jurist: b. Westmoreland County, Va., 5 June 1762; d. Philadelphia 26 Nov. 1829. He was nephew of George Washington. Graduated in 1778 from the College of William and Mary; he studied law with James Wilson (1742-98) (q.v.) at Philadelphia, and practised in Westmoreland County with much success. From 1780 until the surrender at Yorktown, he served in Colonel Mercer's cavalry troop; in 1787 became a member of the Virginia house of delegates; and in 1788 of the Virginia convention for ratification of the Constitution of the United States. In December 1798 he was appointed an associate justice of the United States Supreme Court. He was the first president of the American Colonization Society. (See **COLONIZATION SOCIETY OF AMERICA**, **THE NATIONAL**.) Among his publications are: 'Reports of Cases in the Court of Appeals of Virginia' (1798-9); 'Reports of Cases Determined in the Circuit Court of the United States for the 3d Circuit, 1803-27' (edited by R. Peters, 1826-9). Consult Binney, 'Life' (1858).

Washington, George, American soldier-statesman, and first President of the United



From the Painting by Stuart.

GEORGE WASHINGTON.

WASHINGTON

States: b. 22 Feb. 1732 in the family homestead at Bridges Creek, in Westmoreland County, Va. He was the fifth child of Augustine Washington, who belonged to the third generation of Washingtons who had lived in America. Augustine was a well-to-do planter who might have afforded every school advantage to his son had he not died before George was 12 years of age. The father's death left the son in his mother's care, with a farm on the Rappahannock as his sole inheritance. This precluded any hope of an education in England such as his elder brothers had enjoyed, and he, therefore, received the practical and elementary instruction afforded in colonial Virginia. He learned something in books but more about the forest life, and manly sports, and the habits of a Virginia gentleman. Formal schooling he quit altogether at the age of 16, and began surveying in the employment of Lord Fairfax, an Englishman who came to Virginia to look after his inherited lands, and whose companionship taught Washington some of the conduct and breeding of a man of the world. Though Washington was a mere boy and almost self-taught in surveying, yet he was a good woodsman, and he did his work so well on Lord Fairfax's forest lands that for three years he was kept busy at the profession, which in that day approached nearer to woodcraft than expert mathematics. Meanwhile he did not neglect to give considerable time to the study of military tactics and the manual of arms, for which a Virginian of his standing might have use. This life came to an end in 1751, when the failing health of his elder brother Lawrence caused him to seek recuperation in the Bahamas. Thither George went with him, only to bring him back to die. As executor of his brother's will, he assumed so many cares that his surveying profession had to be abandoned altogether.

Before Lawrence's death he had given George his place in the Virginia militia, and in 1752 Lieut. Gov. Dinwiddie gave the popular young soldier a commission as major and adjutant-general in charge of one of the four military districts of the State. Hardly was he in charge of his new office when a movement of the French to insure their control of the region between the Mississippi and the Alleghenies made war between the French and English in America almost inevitable. From Canada the French had sent 1,500 men to Presque Isle on Lake Erie to erect a fort, intending thence to push through the forest to the Allegheny River and down it to the Ohio. There they would drive out the English, who were beginning to push into that region.

Gov. Dinwiddie saw the danger and, after getting authorization from England, he selected Maj. Washington for a dangerous midwinter journey through the forest to the French fort, to command them to depart and not to trespass upon England's claims. The hardy young surveyor made the terrible journey only to be given the hint that the French had come to stay. Upon his return, the Virginia assembly was persuaded to furnish funds for a force to be sent against the invaders. Washington was made lieutenant colonel, and under Col. Fry set out to resist the French advance. Fry died on the march, and Washington bore the brunt of the enterprise. A rough and ready fort built

by an advance party of backwoodsmen near the junction of the Ohio and the Allegheny was taken by the French, who thereupon built Fort Duquesne and awaited the Virginians. In that neighborhood, at Great Meadows, Washington camped. A skirmish took place in which a small body of French under Jumonville were defeated, and then the defenses, which Washington had built and called Fort Necessity, were attacked, 3 July 1754, by superior French forces. A wretched day of fighting in the rain was followed by a parley, at which Washington sensibly agreed to withdraw from a hopeless conflict. Upon his return to Virginia he was unfairly reduced in rank, and indignantly resigned his commission.

The war for the possession of America was now taken up by the home government. England sent the headstrong Gen. Braddock to help the English colonists to drive out the French. Upon his arrival in Virginia he made the acquaintance of Washington and offered to make him a member of his staff—an offer which was eagerly accepted. Braddock did not realize the difficulties of forest warfare, and without heeding some of the wise counsel given him by Americans, he pushed toward Fort Duquesne with 2,000 regulars brought from England and some provincial recruits. Eight miles from the French fort, he was attacked by an unseen enemy, and the terrified regulars were held in solid ranks to be shot down until sheer fright made them break into retreat. Braddock was mortally wounded, and it was left to Washington to conduct the retreat. After he had led the shattered forces back to Virginia, he became for a time the chief stay of his province in guarding her frontiers against the savages, until, in 1758, he was sent with the British General Forbes again to attempt the capture of Fort Duquesne, and this time success crowned the effort. Then Quebec fell, and England's power in America was firmly established.

When England and her colonies quarreled, Washington took an early and decided part in asserting and defending the colonial rights, though with other American leaders he long looked and hoped for conciliation. To him the Stamp Act was "a direful attack on the liberties of the colonists." In 1769 he thought something must be done "to maintain the liberty which we have derived from our ancestors." He approved of awakening English attention to American rights "by starving their trade and manufactures," and as a member of the Virginia assembly he presented a non-importation agreement, and secured its passage. He was present and gave his support, in 1773, to the resolves instituting a committee of correspondence, and in 1774 he favored the proposed general congress at Philadelphia. On 1 Aug. 1774 the convention met which elected him, with six others, delegates to the first Continental Congress, where he was in the opinion of Patrick Henry "unquestionably the greatest man on the floor," as far as solid information and sound judgment were concerned. When the second Continental Congress met, 10 May 1775, he was again a member, but he was not long to remain there.

After 10 long years of growing irritation between England and America the first blow had been struck. The enraged farmers had followed the intruding British from Concord and

Lexington to the very defenses of Boston, and then with their numbers ever-increasing they settled down in a great half-circle around the town with the purpose of driving Gage, the British commander, into his ships. Everything was in confusion and men came and went much as they chose, kept to their task only by the efforts of a few natural leaders. When the men of New Hampshire and Rhode Island and Connecticut came, not even the fanatic zeal of the siege could banish the provincial jealousies. It was plain to all that there could be no great thing accomplished without a strong leader, one who would make men forget, for a time at least, the most prominent fact in colonial life—the jealous love that every man had for his own colony.

The Continental Congress was forced after a month of hesitation to assume the army before Boston as the "Continental Army." As a commander-in-chief they needed a man who could by his personal influence draw the southern and middle colonies into the struggle which New England had thus far made alone. In this critical moment John Adams saw the wisdom of binding the South to New England's fortunes by choosing a Virginian to lead her army. Local prejudice would have chosen John Hancock, who was bitterly chagrined that he missed the office. At Adams' suggestion the choice fell upon Col. George Washington, who every day since the session began had sat in Congress in his uniform.

The new commander-in-chief was a physical giant, over six feet, and of well-proportioned weight. His composed and dignified manner, and his majestic walk marked him an aristocrat and a masterful man. This character was heightened by a well-shaped, though not large, head set on a superb neck. His blue-gray eyes, though penetrating, were heavy-browed and widely separated, suggesting a slow and sure mind rather than wit, and brilliant imagination. Passion and patience, nicely balanced, appeared in the regular, placid features, with the face muscles under perfect control. A resolutely closed mouth and a firm chin told of the perfect moral and physical courage. His clear, pale, and colorless skin never flushed in the greatest emotion, though his face then became flexible and expressive. Mentally, the directive faculties were the more marked. He had been but half-educated, with no culture except that coming of good companionship. From that he had learned rather the tastes of a country gentleman, courtesy, hospitality, and a love of sport. The soundness of his judgment and the solidity of his information were the notable qualities. He had little legal learning and was too shy and diffident for effective speech. His eloquence was the eloquence of battle. It had the note of challenge, and the gesture of chivalry when it threw down the gage of mortal combat. "I will raise one thousand men," he said in 1775, "at my own expense, and march myself at their head for the relief of Boston." Of original statesmanship he had little, but he had "common sense lifted to the level of genius." Believing in a course, he followed it, single-minded, just, firm, and patient. No rash action or personal caprice was ever charged to him. He was able to bear great responsibility, and courageously to meet unpopularity and misrepresentation. There was no flaw in his devotion. He was

"often anxious, but never despondent." "Defeat is only a reason for exertion," he wrote. "We shall do better next time." This spirit, and his gift for military administration, were the winning traits in the years to come.

On the day before the Continental army fought at Bunker Hill, 16 June 1775, Washington accepted the command in his modest way, refusing to accept any pay for his services, except his actual expenses. To his wife, the one person to whom he would lay bare his heart, he wrote: "I assure you in the most solemn manner that so far from seeking this appointment, I have used every endeavor in my power to avoid it . . . from a consciousness of its being a trust too great for my capacity." "A kind of destiny" had thrown him into this service, and he could not refuse.

Upon his arrival at Boston, 2 July, Washington found his army an armed mob. They had done creditable things, but in a blundering, unmilitary way. Rude lines of fortifications extended around Boston, but they were executed with crude tools and without competent engineers. A few officers were looking after the commissary department, but there was no head. No able officer looked after the recruiting and mustering service, or the barracks or hospital, and there was only a haphazard method of paying the soldiers. There was no uniform, and the very differences in costume augmented the colonial jealousies and self-consciousness. All that distinguishes a well-drilled and equipped army from a mob was wanting; yet here was the weapon with which Washington was expected to defeat the armies of the most powerful nation of the world. Only by the exercise of all his gifts as an administrator did he get even the semblance of an army. His own great care for details, his method and punctuality had their effect upon others, and, though there was malingering, desertion, and petty mutinies, the enemy never knew that the army before Boston was often on the point of dissolution. When, in December, the terms of enlistment ran out, Washington even succeeded, as he said, in disbanding one army and raising another within cannon shot of the enemy. Then early in March 1776 he made an adroit move, seized Dorchester Heights, and left the British nothing to do but evacuate Boston in the utmost haste.

The American leader had scored his first triumph, and, that assured, he hastened with his army to New York, where, it was shrewdly judged, the British would strike next. Congress urged him to hold the city at all hazards, and contrary to his better sense, he attempted the impossible. Without the control of the sea, New York, on its narrow strip of land thrust far down between two navigable waters, was a deadly trap. A military genius would have refused the risk, but Washington ventured it, half believing for a time that he might succeed. He placed his army in a position where every probability pointed to defeat, followed by almost certain capture or destruction. Had Howe not taken such tender care of his enemy's safety, all might have ended there. Washington was able to withdraw from Brooklyn, 30 Aug. 1776, after the defeat on Long Island, and then to evacuate New York and get behind the Harlem, because, as an English critic said, Howe calculated with the greatest accuracy the

MARTHA WASHINGTON.

WASHINGTON

exact time necessary to allow his enemy to escape. The unbounded confidence of Washington's countrymen had proved too much on this occasion for even his steady judgment, and in response to their enthusiasm he had tried to hold a position and defend a place for which his resources were inadequate. He had become for the moment a source of danger to the Americans because they did not understand his real greatness.

Washington realized keenly his own lack of military experience on a large scale—he had no heaven-born genius, and he knew it. The skill that he finally attained was that which a strong-brained, sensible man would get in any vocation which he plied industriously, and to which he gave his heart. Washington learned as he fought, and his early errors with the consequent disaster, grew steadily less, until, as a master of his profession, he issued from the war without a peer and almost beyond the reach of envy. Yet not even his ultimate military greatness explains his real service to his countrymen. It was the confidence that Washington inspired as a man, rather than his great genius as a soldier, which made him the only man in America who could carry the Revolution to a successful issue.

After losing New York Washington fought step by step, as he retreated, repulsing the British at Harlem Heights and holding his own at White Plains, 28 Oct. 1776, but the meddling of Congress cost him some 3,000 men captured in Fort Mifflin, and then there was nothing for him but a retreat from the Hudson through New Jersey. This was not the only time that the democratic faction in Congress forced their military plans upon their commander-in-chief. He was much hampered at first by Congressional interference in his military plans, but he soon won the limitless faith of these democratic enthusiasts, conquering all their fear of military despotism and gaining in the disposal of his own army the supremacy of a Frederick or a Gustavus Adolphus.

As the American army fell back mile after mile the character of the leader was tested to its utmost. His generals grew insubordinate, his men deserted by whole companies, throughout the Jerseys thousands took oath of allegiance to George III, and everywhere there were murmurs of discontent with this sort of a campaign. Then it was seen that Washington's courage was not mere disregard of danger, but the sort that long endures uncertainty and never shrinks from responsibility, bearing in silence temporary unpopularity or exasperating misrepresentation.

When the army at last crossed the Delaware the roll-call would muster but 3,000 men. Straining his powers to the furthest bounds, Washington kept this force together, and added as many more. Concerning some of his extraordinary measures, Washington wrote Congress: "A character to lose, an estate to forfeit, the inestimable blessing of liberty at stake, and a life devoted must be my excuse." Before the holidays he was ready to strike a blow for liberty, and to sustain his character. Crossing the Delaware, 25 Dec. 1776, in spite of pitchy darkness and grinding ice, he marched through a sleeting storm nine miles to Trenton. The Hessians there were surprised and driven to surrender. Some 900 prisoners were taken

to the other side of the river, and then Washington crossed again to win another victory at Princeton. The whole situation was changed. The wretched retreat was forgotten or regarded as only the prelude to the startling and brilliant victories. In England, Walpole declared that Washington was both a Fabius and a Camillus. His whole campaign got a new color because of its issue. In the Russian court, in Frederick's cabinet, and in the aristocratic circles of Paris, Madrid, and Vienna the campaign was praised as if the end had been in Washington's view from the first. The victories made Washington's military reputation rest on something tangible, to which men might point. Mere faith such as the Americans had shown heretofore had little effect on foreign critics. The European soldiers grew more interested, and their favorable opinion had vast influence in winning foreign aid. Washington had been so consistently patient and brave in adversity, so silent under unjust criticism, never talking down his mistakes, or glossing his errors, that the hour of victory brought its ten-fold reward in sympathy and confidence. He had quietly assumed so much obloquy that any stint of his praise seemed unjust and ungenerous. The victories renewed American confidence in their leader, and from that time on whatever there was of unity for political or military purposes among the 13 States came of the common faith in Washington.

Congress now put its whole trust in him—until a temporary reverse put him again in the shadow of its distrust. It provided for long enlistments to take the place of the evanescent three months' levies that had ruined Washington's army heretofore, just as he had it drilled. He was made a veritable dictator as to all that might affect the success of the army, its discipline, and its supplies. It was well that the commander-in-chief had made this brilliant stroke, which appealed to all those who saw only the surface of the Revolution. For 18 months thereafter nothing but reverse and misfortune and terrible trial fell to the leader's lot. While Gates was gathering unearned laurels at Saratoga, and the American cause was vastly advanced by Burgoyne's defeat and the consequent French alliance—while others were getting glory and significant victories, Washington was maneuvering with Howe, always refusing battle, or, as at Brandywine Creek, 11 Sept. 1777, and Germantown, 4 Oct. 1777, meeting defeat. To the superficial observer there was only failure for Washington and success for his rivals. There seemed no great work in merely keeping an army together, delaying Howe and keeping him from going north to Burgoyne's rescue. When, at last, the British settled down cosily in the "rebel capital"—when Philadelphia had taken Howe, as Franklin so cleverly expressed it—Washington encamped at Valley Forge, 19 Dec. 1777, his popularity waning at the very moment when he began to render his greatest service to his country. There, in the most trying hour, he continued to do what had been his greatest task from the first. In spite of jealous States and a wrangling Congress, and while deprived of all that source of power which a strong government gives to a commander, Washington kept together a starved and suffering army by his personal firmness, patience, and judicious handling of men.

WASHINGTON

While the burden of his trial was greatest there grew up in Congress an ugly scheme to put Gates in Washington's place. From the first there had been intrigue among the officers. "I am wearied to death," John Adams wrote, after a visit to the army, "with the wrangles between military officers high and low. They quarrel like cats and dogs. They worry one another like mastiffs, scrambling for rank and pay like apes for nuts." Amid this Washington had lived disturbed, but not concerned for himself. Now Congress was implicated in the plotting. Some were impatient with the Fabian policy, and, like Adams, wanted "a short and violent war." A conceited or vain man would have resigned and let the whole cause go to perdition as a vindication of himself, but Washington was nobler than that. Throughout the Revolution he kept the same spirit that animated him in the earlier years of border fighting. Then he had declared: "I could offer myself a willing sacrifice to the butchering enemy, provided that would contribute to the people's ease." He could "die by inches to save a people." During the Revolution he risked reputation, sacrificed popularity, suffered in mind and heart all that he had been willing to suffer in body to "save a people." Now he silently watched the plot ripen, and at the right moment exposed it with a royal contempt that quite crushed the plotters.

When the winter was gone there came the news of the French alliance. A fleet from France was menacing the British army in Philadelphia, and orders came for the evacuation of the city. They began a march toward New York across New Jersey. At Monmouth, 28 June 1778, the American army fell upon them, and, but for the cowardly or traitorous conduct of Gen. Lee, nothing but the fragments of the English army would have reached its destination. In that moment men saw what a tempestuous nature Washington habitually held in check. He stopped the retreat that Lee had unaccountably ordered, and in ungoverned rage cursed him for a coward. The troops were rallied, and they successfully engaged the enemy, but the moment for victory had been lost. The British reached New York in safety and Washington took a post on the Hudson.

Now came the supreme test that proved the American leader's unrivaled fitness for the work that he had to do. For three years, while Congress was helpless, unable to tax or get aid from the States, while it paid the soldiers in paper, so valueless that the pay of a colonel would not purchase oats for his horse, while nothing but a forced levy would secure food for the army, when a hundred men a month went over to the enemy in sheer desperation with suffering for food and clothing, while the great country that had so much at stake seemed absolutely indifferent—in the midst of blank despair Washington kept his heart and his purpose. Again and again he was disappointed by the failure of the promised aid from France—the naval aid that would prevent the British escape by sea if they were worsted on land. At last, however, the moment came when De Grasse with a French fleet held a temporary control of the sea, and Lafayette had pushed Cornwallis out on the peninsula at Yorktown. A few days' hesitation would have lost the opportunity, but the man who had waited three

years knew the moment for action when he saw it. Making a feint that deceived the enemy at New York, he got well on the way before his aim was guessed. For 400 miles he urged his eager army, and brought 6,000 men to Lafayette's aid at just the hour to render Cornwallis' escape impossible. The siege that then began could have but one end as long as De Grasse controlled the sea. The British surrendered, 19 Oct. 1781, and the war was ended.

As men looked back over the years of strife, they saw clearly that the greatest factor in the final success of the Revolution was the personal leadership of Washington. If we seek to explain it, it was not his great mind, for Franklin's was greater; not his force, energy, or ingenuity, for Benedict Arnold surpassed him in these qualities, not his military experience, for Charles Lee's was far more extensive; but it was the strength of character which day by day won the love of his soldiers and the perfect confidence of his countrymen. The absence of a mean ambition, the one desire of serving well his country and his fellow men, the faithfulness that could not be driven from its task through jealousy or resentment—these were the traits that gave him a unique and solitary place among the world's heroes.

Washington's service to his country was not to end with Yorktown. As he had been "first in war," because he was most fitted, so his unique character and pre-eminent place in American hearts fated him to become "first in peace." His last successes had still more firmly fixed his power among the people. Their thoughts and imaginations were filled with him. But they had not even yet seen the sublimity of his character. With a discontented and insubordinate army still in arms and with no real government in existence, Washington was the only source of authority and law that had anything more than a local influence. The weak Union might have at once lost all cohesion, and America might have degenerated into a number of petty, feeble, and hostile States. Worse than that the hopes for an American republic might have been indefinitely delayed, for, in the despair which settled upon many, there seemed but one escape from the political storm that threatened—they would make Washington king. In the army this plan was gravely considered, but when broached to Washington, he expressed himself as pained that such ideas existed in the army. "I am much at a loss to conceive what part of my conduct could have given encouragement to an address which to me seems big with the greatest mischiefs that can befall my country." To nobody could such a thought be more disagreeable, he declared earnestly. "Let me conjure you, if you have any regard for your country, concern for yourself or posterity, or respect for me, to banish these thoughts from your mind."

When the country seemed indifferent to the deserts of the army, when there was talk of disbanding it without provision for the future or even pay for what it had done, and when as a natural result there was mutiny and threat that the army would take government into its own hands—then it was Washington who tirelessly urged upon Congress and upon the States the justice of the soldiers' claims. Though he longed to go back to his home and to have his work done, yet he waited through

months of weariness until the British really left the country, and until the proper laws at least had been made to insure the soldiers' rights. Then at last, he stood among his officers at Fraunce's Tavern, bidding them to take him by the hand, while he gave them each and all the warm-hearted farewell that so fittingly ended their long years of trial and companionship.

For a brief time Washington now became "a private citizen on the banks of the Potomac"

"free from the burles of a camp and the busy scenes of public life," planning as he said to "move gently down the stream of time until I sleep with my fathers." He did not see in this happy hour that his past services had but devoted him to further service, and that he had become "the focus of political intelligence for the New World." Even before resigning his leadership he had urged the States to put faction and jealousy away and make "an indissoluble union under one federal head." As the affairs of the confederation became more and more deranged, and America, "like a young heir," as Washington wrote, wanted and ran riot until its reputation was brought to the brink of ruin, their great leader warned them that it was in the choice of the States and depended upon their conduct, whether they would be respectable and prosperous, or contemptible and miserable as a nation.

The politically starved Congress grew daily weaker. It could not even persuade the States to carry out the terms of the treaty of peace or pay their debts to foreign countries. Congress was despised at home, and America was disgraced abroad. The world looked on to see the confederation go to pieces. Within the individual States the mob seemed to have gained control and the law-giving bodies abandoned themselves to paper money and other economic vagaries. There was quarreling over State boundaries and commercial restrictions, one State against another, until thoughtful men like Washington urged that, if they were not a united people, they should no longer act the farce of pretending it. At last, however, his own endeavors united with others brought about a convention of the States, and that led to another which met at last in May of 1787, at Philadelphia, destined, if not purposed, to give America a new and stronger frame of government. To that convention Washington reluctantly came. He thought himself a soldier but no statesman. When at last he was persuaded that the chief hope for success must come from his approval, and that his mere presence would lend dignity and power to the convention, he yielded. As the delegates slowly assembled, he grew eager for the success of the work, and would listen to no half-way measures. "Let us raise a standard to which the wise and the honest can repair," he said to those who talked of a weak plan. When the work began he was chosen president of the convention, and, though he was no parliamentarian, his prominent place lent gravity and steadiness to the business.

After the Constitution was completed, and when it was before the country for approval, Washington had never been seen so eager for anything as for the adoption of the new scheme of government. It was only by active letter-writing that he used his influence, however, for the work of the politicians was out of character for him. The final success was very grate-

ful to him, but, when the new government was being set up, and the whole country turned to him as their choice for President, he held back, diffident and reluctant. He yielded at last because, as Hamilton represented to him, "In a matter so essential to the well-being of society as the prosperity of a newly instituted government, a citizen of so much consequence as yourself to its success has no option but to lend his services."

His was a noble figure to stand in the forefront of a nation's history. His simple manner well graced a republic, and yet there was a gravity and a lofty courtesy that lent dignity to democratic forms. His own self-mastery was a living lesson to democracy with its ill-repute for turbulence. No more fitting ideal of manhood could have been chosen for a new republic. It is, indeed, creditable to the men of that day that they were won by a character so unpretentious.

The political leadership was very unattractive to Washington. When the formality of election was over, he went to the seat of government with "feelings not unlike those of a culprit who is going to the place of execution." He bade adieu to private life and to domestic felicity, going to his new duties with resolution, but anticipating no joy in them. On his way the demonstrations of the people only filled him with forebodings. "The decorations of the ships, the roar of the cannon, and the loud acclamations of the people which rent the skies as I walked along the streets, filled my mind with sensations as painful as they are pleasant." After he had sworn, 30 April 1789, in the open balcony of the Federal Hall, that he would faithfully execute the office of President of the United States, he read his address in the Senate Chamber. "The magnitude and difficulty of the trust," he protested once more, "could not but overwhelm with despondence one who, inheriting inferior endowments from nature, and unpractised in the duties of civil administration, ought to be peculiarly conscious of his own deficiencies."

He realized keenly from the first that he walked "on untrodden ground." Scarcely any part of his conduct might not thereafter be drawn into precedent. There must not be a government only, but a body of public opinion that would uphold it. Governmental action must be mixed of firmness, prudence, and conciliation, said Washington, if it would win liking and loyalty as well as respect. He resolved to give it every proper form of dignity, ceremony, and prestige that would appeal to the imagination of the people. Men must see that it was a real government, supreme in the land. To this end he adopted forms that some thought stiff, some unrepugnant, but which all were soon taught to respect. "If there are rules of proceeding," he wisely concluded, "which have originated from the wisdom of statesmen, and are sanctioned by the common assent of nations, it would not be prudent for a young State to dispense with them altogether."

It was not by this conservatism alone that he gave strength to the new government, but by that unerring judgment which led him to choose men like Hamilton, Knox, Jefferson, and Randolph, and then to take for his guide Hamilton, the greatest of these for the present needs of the government. Natural leader as Wash-

ington was, he recognized the gifts and talents of others, and gave to each the task for which he was fitted. Hamilton's genius in affairs had not been in just the lines along which he was now to act, but his bold and original mind Washington saw to be a fit instrument to set the new government on a strong foundation. Hamilton quickly demonstrated the wisdom of the President's choice. He funded the public debt and established confidence in the nation's honesty. He prevailed upon Congress to assume the State debts and thus transferred the interest of creditors to the central government. A bank of the United States was created at his call, the "implied powers" of the Constitution being thus brought to the support of a strong government, and the commercial classes won by this attention to their interests. He was enabled to do these things successfully because he had the strong will of Washington with him. The fiscal measures had been made the President's own, because he was convinced that they were right, not merely that they were expedient. The end that was sought was the purpose that Washington held from the first, a strong and righteous government.

Hardly had things been set aright in the new nation's household than there came disturbing forces from abroad. The French people had gone upon a wild quest for liberty that threatened to turn the world upside down. The madness spread even to America—or rather seemed to leap by a strong attraction straight to America's democratic shores. France was soon fighting the conservative world, and what was more fitting than that liberal America should come to her aid? A French agent hastened to America to ask the people that very question. Washington determined that America, herself but "in a convalescent state," should not be drawn into the European struggle. She was too provincial at the best, too interested in European opinion and politics, and too oblivious of her own nationality. "I want an American character," the wise President declared, "that the powers of Europe may be convinced we act for ourselves, and not for others." He would avoid their disputes and their politics, and he purposed "if they will harass one another, to avail ourselves of the neutral conduct we have adopted." Washington, with a few others, stood almost alone in the advocacy of statesmanship rather than sentiment. In a few months, however, the public eyes were able to see more clearly, and the administration got the support that it deserved. The demands of the French revolutionary government were refused, and the President issued a proclamation of neutrality.

Meanwhile the country had learned that the new central government proposed to enforce its laws even within State boundaries. The rebellion in the back counties of Pennsylvania was quelled by the strong action of the central power. There could be no return to the time when there was no power but that of an individual State. The national government was expected thereafter to make itself felt directly upon the individual, and men began to look to it therefore in awe and reverence.

A second time Washington consented to hold the reins of power, and again, as in the Revolution, he felt the bitterness of unpopularity. All the honor that he had gained could not protect him from the hasty wrath of a people dissatis-

fied with his policy toward England. Because he strove for peace he was roundly abused in terms scarcely suited "to a Nero, a notorious defaulter, or even a common pickpocket." It saddened but did not change him. He was only the more unwilling to serve another term, and, when his eight years of civil service ended, he said farewell to the people he had served through a generation. He gave them the simple advice that they most needed. Tears coursed down his cheeks as he turned for the last time from the throng that had listened to him in love and sorrow. Three years he lingered in retirement at Mount Vernon, and then died, 14 Dec. 1799, as he had wished to live "amid the mild concerns of ordinary life."

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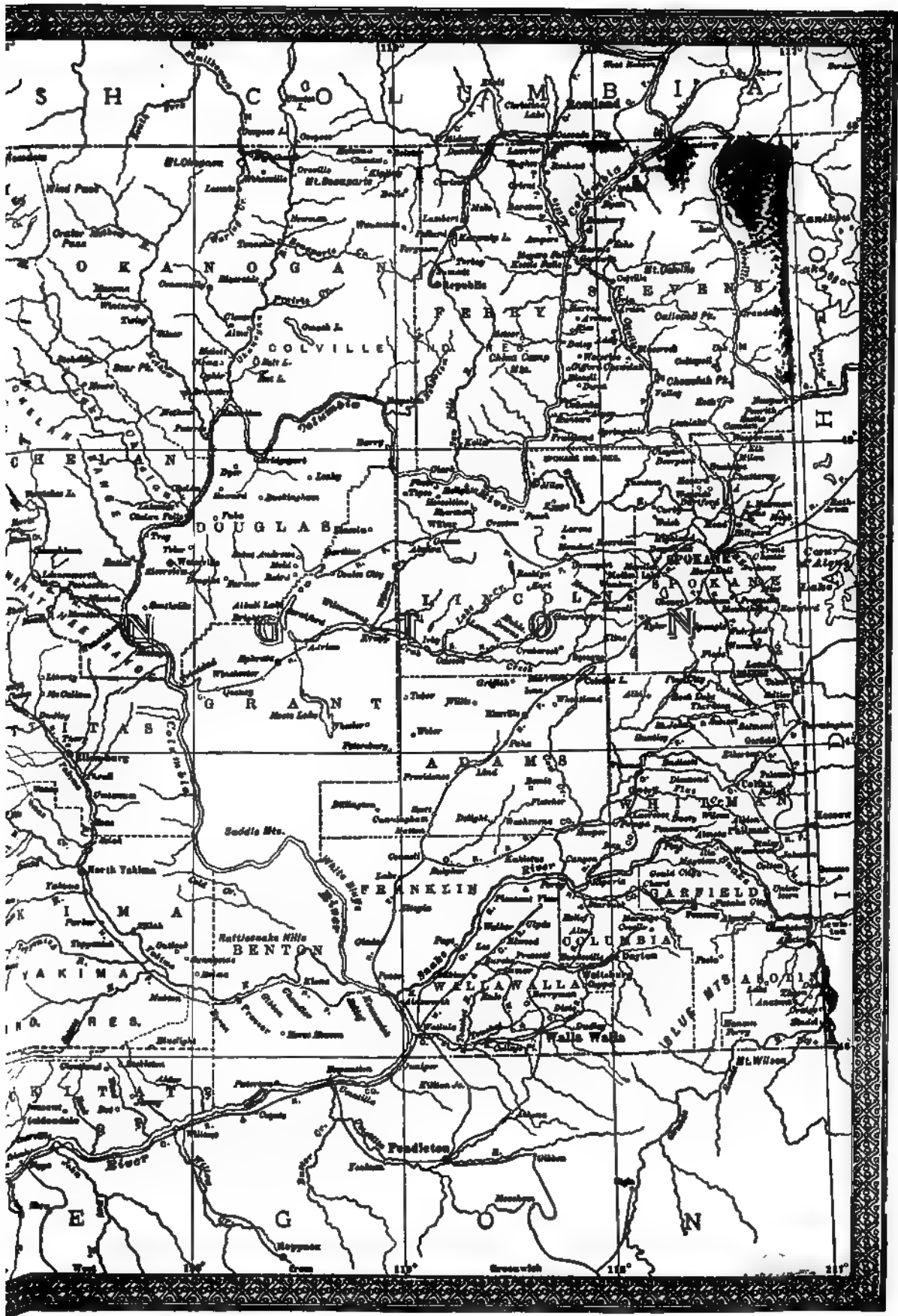
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Washington, the "Evergreen State," admitted to the Union, 22 Feb. 1889, is bounded on the north by the Strait of Juan de Fuca and British Columbia, on the east by Idaho, on the south by Oregon, and on the west by the Pacific Ocean. Capital, Olympia. Area, 69,180 square miles (land 56,880, water, 2,300). Population (1900) 518,103; according to the 1910 census, 1,141,990.

Topography.—Washington is divided into two distinct sections by the continuous range of the Cascade Mountains, extending clear across the State from north to south. These sections are known as eastern and western Washington. The eastern section contains about three fifths of the land area of the State and the western section about two fifths. In its physical features the State is characterized by a great diversity of topography, ranging from low plains, a few feet above the sea-level, to snow-covered mountains, several of which exceed 10,000 feet in height, together with broad, rolling prairies, elevated plateaus, deep cañons and fertile valleys. This great diversity of topography presents ever changing scenery and gives rise to a great variety of climate, rainfall, vegetation and occupations of the people.

Topographically, the State may be divided roughly into seven sections: *First:* The peninsula lying between Puget Sound and the Pacific Ocean. The greater part of this peninsula is occupied by the Olympic Mountains, which form a segment of the general coast range. The highest of these mountains reach elevations of from 7,000 to 8,000 feet. The whole section, with the exception of a strip a few miles in width along the coast, presents a very rugged surface, broken into high peaks, steep slopes, deep cañons and sharp serrated divides, which are almost inaccessible in many places, and as a consequence, these mountains form the least known section of the United States. The high-

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WASHINGTON

est peaks of the Olympics are Mount Olympus, 8,131 feet; Fitzhenry, 8,098 feet, and Constance, 7,777 feet. *Second:* The Puget Sound basin, a wide valley lying between the Olympic Mountains on the west and the Cascade Mountains on the east, extending in a north and south direction from the British Columbia line nearly to the southern part of the State. This basin consists largely of rolling land with many quite extensive level tracts. The soil consists principally of glacial deposits covered in the lower portions by alluvium. *Third:* The Cascade Mountains, which form the most prominent feature of the topography of the State. The general height of these mountains is about 8,000 feet above the sea-level with a number of peaks rising much higher, the highest being Mount Rainier, 14,526 feet; Adams, 12,470 feet; Baker, 11,100 feet; Saint Helens, 9,750 feet, and Stuart, 9,470 feet. *Fourth:* The Okanogan Highlands, extending eastward from the Cascade Mountains to Idaho and lying north of the Columbia and Spokane rivers. This section is characterized by a beautiful rolling surface, with long, gentle slopes reaching down from the watersheds to the wide stream basins. The divides, although attaining heights of 5,000 feet and more, are generally rounding and not sharp or abrupt. *Fifth:* The Columbia plain, which includes nearly all that part of Washington lying south of the Okanogan Highlands and east of the Cascade Mountains. From the Columbia at a height of 500 or 600 feet above the sea, the plain rises gradually to the westward and eastward, reaching a general elevation of about 2,000 feet in the higher parts, with some hills and ridges rising from 1,000 to 2,000 feet above the surrounding plain. Much of this plain is in the form of an elevated plateau with a rolling surface. Several sharp ridges of a mountainous character run down from the Cascade Mountains in an easterly direction toward the Columbia River. *Sixth:* The Blue Mountain Range on the border line of Washington and Oregon represents a local mountainous section in the Columbia plain. These mountains are located in the extreme southeastern portion of the State, the highest points rising 7,000 feet above the sea and about 5,000 feet above the surrounding plain. *Seventh:* The lower Columbia and Pacific Coast section includes that part of the State lying west of the Cascade Mountains and south of Puget Sound and the Olympic Mountains. This section consists largely of ranges of low mountains or hills, with broad valleys intervening, nearly all of which are covered with a dense growth of forest. In this section there are also a few rich prairies of limited extent.

Rivers, Lakes and Harbors.—The principal river of Washington is the Columbia, which enters the State from British Columbia, at about 117° 30' W. longitude, from which point it pursues a southerly course for about 110 miles, flowing thence westerly for about 100 miles, thence south and southeasterly for 225 miles where it unites with its greatest tributary, the Snake River; from this point it pursues a westerly course, flowing between the States of Washington and Oregon, breaking through the Cascade Mountains and entering the Pacific Ocean in lat. 46° 15'. Its principal tributaries in eastern Washington are the Pend d'Oreille, or Clark's Fork, which is the outlet of Lake Pend d'Oreille in northern Idaho; the Spokane

one of the largest tributaries, the outlet of Lake Coeur d'Alene, also in Idaho; the Okanogan, flowing from the north through Lake Okanogan in British Columbia; the Methow; Lake Chelan and its outlet; the Wenatchee and the Yakima, flowing down from the Cascade Mountains, and the Snake River, its largest tributary, which rises in the western part of Wyoming and flows through the southern part of Idaho. In western Washington its principal tributaries are the Lewis and the Cowlitz rivers. The other rivers of the State of any considerable size are the Nooksack, Skagit, Stillaguamish, Snohomish, Skykomish, Snoqualmie, Cedar, White, Duwamish, Puyallup and Nisqually, which flow into Puget Sound from the Cascade Mountains and the Chehalis which flows into Gray's Harbor. The Columbia is navigable for ocean-going vessels to Vancouver and for steamboats over the greater part of its course. The Snake is navigable for more than 150 miles. The Okanogan, Lewis, Cowlitz, Nooksack, Skagit, Snohomish, Duwamish, Puyallup and Chehalis rivers are also navigable for considerable distances.

There are many fresh water lakes in the State. The largest is Lake Chelan, lying between the eastern ridges of the Cascade Mountains. This lake is 50 miles long, from one to three miles wide and more than 1,500 feet deep in many places. It extends from a point near the Columbia River into the very heart of the mountains, and the tourist can here enjoy the novel experience of sailing for more than 30 miles between high ranges of mountains, rising from the water's edge, whose snow-crowned peaks reach elevations of from 7,000 to 10,000 feet above the sea. This part of the State has some of the grandest scenery in the world. Lake Washington, lying in the western part of King County, bounding Seattle on the east, is a beautiful lake 22 miles long, and from 2 to 4 miles wide. The surface of this lake is about 20 feet higher than the mean high tide in Puget Sound, and a government canal is now under construction, at Seattle, to connect it with the Sound. Lakes Crescent and Cushman are the largest lakes in the Olympic Mountains and lakes Wenatchee, Kalchess, Kicheloa, Moses and Cle Elum, are the largest in eastern Washington.

Willapa Harbor and Gray's Harbor are the only good ports on the Pacific Coast. Neah Bay, Clallam Bay, Port Angeles and Dungeness are excellent ports on the Strait of Juan de Fuca. Puget Sound, as it is now known, includes all the waters of the great inland sea, which extends easterly from the Strait of Juan de Fuca, and southerly from the national boundary line to Olympia, a distance of about 200 miles. The waters of the Sound are from 60 to 1,000 feet in depth. The rise and fall of the tide ranges from 9 to 18 feet. There are no sunken reefs or other dangerous obstructions to navigation. The coast line aggregates about 1,600 miles in length. The principal harbors along the Sound are Bellingham Bay, Everett Harbor, Port Townsend, Seattle Harbor, Commencement Bay or Tacoma Harbor and Port Orchard. Owing to the fact that Puget Sound is protected on all sides by high mountain ranges, it may be considered as one great harbor in which vessels can land at almost any point along the whole coast line.

Climate and Rainfall.—Owing to the topography there is a great diversity of climate in

WASHINGTON

Washington. The Cascade and Olympic Mountains and the great plateau or elevated plain of the Columbia play the most important parts in causing this diversity. The Cascade range divides the State into two distinct climatic zones, in which there is little similarity of climate. In the eastern section the climate is dry or semi-arid. The seasons are four, spring, summer, autumn and winter. The average annual rainfall varies in different localities, ranging from 6.50 inches at Pasco to 18.25 inches at Spokane and 24.90 inches at Dayton. The mean January temperature ranges from 22° to 30° in different localities, according to the elevation, and the mean August temperature ranges from 65° to 74°. The highest temperature on record at Yakima, which is a fair average, is 108°, and the lowest is 22° below zero. The climate of the whole of the eastern section is remarkable for its brightness and clearness. The winters are short, and although the days are often hot in summer, the nights are cool and delightful.

In western Washington the climate is equable, with no extremes of heat and cold. Only two seasons are spoken of,—summer and winter. The summers are cool or moderately warm, and the winters are mild and rainy with almost no snow, except on the mountains. In summer the temperature rarely reaches 90°, and in winter it never goes as low as zero. At Seattle, which is a fair average for western Washington, the annual mean temperature is 51.4°, ranging from 40.6° in January to 64.7° in August. The average high temperature is 74° in July and 70° in August, and the average low temperature is 43° in December and 38° in January. The rainfall in western Washington varies greatly in different localities owing to the mountain ranges and prevailing winds. The heaviest precipitation occurs on the coast of the Pacific Ocean and gradually decreases as it proceeds inland around the south side of the Olympic Mountains and down the Puget Sound basin. The annual rainfall averages 89.27 inches on the coast at South Bend; 52.65 inches at Olympia; 43.88 inches at Tacoma; 37.34 inches at Seattle, and 22.42 inches at Port Townsend. While winter is called the rainy season and summer the dry season, it should be understood that every month in summer has some rainy days and that there is considerable clear weather during the winter months. For a period of ten years, during the months of December, January and February, the average number of days per month with precipitation to the amount of .01 of an inch has been from 15 to 19, and the average precipitation per month about five inches; the average number of rainy days in July and August for the same period has been five, the average precipitation has been about one inch each month, and the average number of rainy days has been 162 per year. Thunder and lightning are of rare occurrence and violent wind storms are entirely unknown.

Geology.—Metamorphic rocks occupy a large portion of the State, being of very frequent occurrence throughout the region of the Cascade Mountains and the Okanogan Highlands. The most important varieties of these rocks are gneiss, schist, marble, slate and quartzite. Granite is found in many localities in very large quantities. Crystalline limestone also occurs in a number of places, particularly in the Puget Sound basin. The most important volcanic rock

in the State is the basaltic rock of the Columbia plain, which not only extends over a large portion of Washington, but also covers all of southern Idaho, eastern Oregon and north-eastern California. Sedimentary rocks cover a large portion of the State. The rocks of the Tertiary period are the best known, and are of great economic importance on account of the large deposits of coal and building stone which they contain. The Eocene rocks are nearly all coal-bearing. Pleistocene sediments, in the nature of glacial deposits, occur in the western and northern parts of the State. In all of the mountainous districts, except the Blue Mountains, glacial deposits are found, and the valleys are largely occupied by deep terraces and moraines. The glacial deposits of the Puget Sound basin consist of till, with stratified sand, clay and gravel, in all averaging not less than 500 feet in thickness.

Soil, Agriculture and Irrigation.—There are about 40,000 square miles of forested land in the State, the trees being mostly conifers, with some oak, maple, cottonwood and other deciduous varieties. Nearly all of the western section of the State was originally covered with forests, while in the eastern section the forest areas are confined principally to the slopes of the mountains and the highlands. The soil in western Washington consists largely of glacial drift, being a mixture of sand, gravel and clay upon the uplands, which is very productive when properly handled. In the lower lands there are large areas of sandy loam and semi-peat lands, rich in organic matter, which are very fertile, and grow all kinds of crops that thrive in a porous soil.

In eastern Washington the soil has been formed by the disintegration of basaltic or lava rocks. It is of a dark color, of fine texture, and contains no gravel and very little sand. It is what might be termed a clay loam. It has been stated by eminent authorities that this is the best wheat land in the world, a statement which is proved by the enormous crops produced each year. The higher lands of the Columbia plain are devoted principally to the cultivation of wheat, which is the most important agricultural product of the State. The annual crop of wheat averages about 30,000,000 bushels, and the average yield per acre is about 26 bushels.

In the lower lands of the eastern section the rainfall is insufficient to bring crops to maturity, and irrigation is carried on to a considerable extent with great success. There are now about 150,000 acres of irrigated lands under cultivation, and nearly 100,000 acres more under ditch and ready for cultivation. Numerous irrigation projects are in progress which will result in the reclamation of at least 1,000,000 acres within the next few years. The irrigated lands produce wonderful crops of fruits, vegetables, hay, hops and grain. The climate is very favorable and a great variety of apples, peaches, plums and kindred fruits are raised in great abundance, together with grapes, strawberries, blackberries, raspberries and other small fruits of every kind. The fruits raised in eastern Washington are beautifully colored and of most excellent flavor. The soil of the irrigated section is admirably adapted to the cultivation of all kinds of vegetables, and especially to the cultivation of potatoes, of which large quantities are produced each year. Alfalfa is one of the chief forage

LARGEST LUMBER MILL IN THE WORLD,
Situatcd at Port Blakely, Wash.

ALONG THE BUSY WHARVES.

Photographed by Lynn, Tacoma.

Showing vessels engaged in the lumber trade, one of Tacoma's chief industries.

WASHINGTON

plants, producing three or four crops during the season and yielding from 5 to 8 tons of hay per acre. Timothy, clover and other grasses are also raised quite extensively. Hop raising is an important industry, the average crop being 3,500,000 pounds per year. All kinds of cereals are also cultivated to some extent. The Okanogan Highlands and the slopes of the Cascade Mountains furnish extensive ranges for cattle and sheep, which are raised in large numbers. With the settling up of the country, however, the ranges are becoming more restricted year by year, and, as a consequence, domestic methods of stock raising are being adopted with a resulting yearly increase in production.

In western Washington diversified farming, dairying and fruit raising are the principal agricultural pursuits. This section of the State is admirably adapted to the dairying industry owing to the rich soil and the moist, warm climate, which combine to produce an abundance of nutritious grasses, hay, and other stock food, and excellent water. The home market is one of the best in the world, on account of the large population, engaged in manufacturing, lumbering, fishing and mining, and the trade with Alaska. There are 345 creameries and condensed milk factories in the State. All kinds of stock do well in this section and large numbers of horses and hogs are raised. The breeding of Angora goats has also been undertaken with marked success and is becoming an important industry. Hop raising is carried on quite extensively in the river valleys, the average crop being about the same as in eastern Washington; considerable small grain is raised in this section, especially upon the flat lands along the shores of Puget Sound.

Lumbering.—The greatest industry of the State is the manufacture of lumber and shingles. There are in the State 419 lumber mills, with a daily capacity of 26,000,000 feet, and 441 shingle mills, with a daily capacity of 42,000,000 shingles. There are also more than 300 logging camps and a number of planing mills and wooden-ware factories. These mills, factories and camps employ more than 30,000 men; the annual pay roll amounts to \$20,000,000, and the value of the product is about \$35,000,000 annually. The capital employed in lumbering amounts to about \$40,000,000. In 1903 there were 42,701 cars of lumber and 35,764 cars of shingles shipped from the State by rail and 770,057,846 feet of lumber shipped by water. The rail shipments of lumber amounted to 640,515,000 feet, making the total shipments for the year 1,410,572,846 feet, and the number of shingles 5,722,240,000. In addition to the lumber shipped out of the State a large quantity is used in making local improvements. The quantity of timber used by the mills in 1903, aggregated nearly 2,000,000,000 feet board measure. In 1902, the United States Department of the Interior caused an estimate of the quantity of merchantable timber in the State to be made, which shows the total to be 195,237,000,000 feet, board measure. The most valuable tree of the State is yellow fir (*Pseudotsuga Douglasii*), which comprises nearly one half of the merchantable timber. The next most valuable is the red cedar (*Thuja gigantea*), used extensively in the manufacture of shingles. Western hemlock (*Tsuga mertensiana*), yellow pine (*Pinus ponderosa*), sugar pine (*Pinus*

lambertiana), spruce (*Picea sitchensis*) and western larch (*Larix occidentalis*), are also valuable commercial varieties. At the present rate of consumption, the amount of standing timber will supply the mills of the State for at least 100 years.

Mining.—Coal is first in importance in the mining resources of the State. The greatest deposits are found in the Puget Sound basin, and on the eastern slopes of the Cascade Mountains in Kittitas County. The coal fields are very extensive and practically inexhaustible. The veins vary from 5 to 25 feet in thickness. The quality ranges from a rich bituminous coking coal to brown lignites. Deposits of anthracite have also been discovered in the vicinity of Mount Rainier. There are 23 mines in operation, employing about 5,000 workmen. The aggregate output during the year 1909 was 3,602,263 tons of coal and 42,981 tons of coke. The mines of Washington and British Columbia practically supply the Pacific Coast States and Alaska with coal.

There are large deposits of iron ore in the Cascade range and in the Puget Sound basin. Brown hematite ore is found along the Skagit River and is worked to some extent. Magnetic ore is found in King County and bog ore occurs in several localities. Copper and lead are found in the Cascade Mountains and the Okanogan Highlands.

The precious metals are found in several localities, and sufficient development work has been done to prove the existence of mines of great value. In the northeastern part of the State, the mines have been worked on quite an extensive scale. The prevailing country rock, in that district, is limestone and the principal mineral is argentiferous galena. Gold has been discovered in many places throughout the whole extent of the Cascade range and in the Okanogan Highlands.

Fisheries.—Salmon fishing is one of the important industries of the State, and her brands of canned salmon are known in every market in the civilized world. The capital invested in the industry exceeds \$6,000,000; the number of persons employed is about 10,000 and the wages paid amount to more than \$3,000,000 annually. The value of the yearly product of the canneries ranges from \$5,000,000 to \$8,000,000 according to the run of fish, and the value of the fresh, salted and smoked product, will amount to about \$1,500,000 more each year. There are 45 salmon canneries in the State. The propagation of salmon was undertaken by the State in 1895, and since that time 18 hatcheries have been established with a capacity of from 4,000,000 to 8,000,000 fish each per season. This work has been very successful, and has resulted in quite an increase of the supply of salmon. In addition to the salmon industry, the cod, halibut, mackerel and herring fisheries on the banks off the coast of Washington and Alaska give employment to a large number of men. Large quantities of halibut are shipped to the Atlantic coast cities in refrigerator cars, and that line of fishing has developed into an important industry. Oyster culture is also carried on to quite an extent in the shallow waters of Puget Sound and Willapa Harbor. Clams, crabs and shrimp are abundant, and many kinds of game fish are found in the streams and fresh water lakes.

WASHINGTON

Game.—There is a great abundance of large and small game in Washington. Deer are found in all sections, elk abound in large numbers in the Olympic Mountains and to some extent in the Cascades. Mountain goats are numerous on the higher ranges of the Cascades. There are a few mountain sheep on the lofty mountains. Black bears, panthers and wildcats are common. Waterfowl, pheasants, quail, prairie chickens and several kinds of grouse are plentiful.

Manufacturing.—When the census of 1909 was taken, there were 3,674 manufacturing establishments reported in this State. The amount of capital invested was \$222,261,000; the number of persons employed, including clerks and members of firms, was 76,854; the amount of wages and salaries paid was \$59,593,000, and the value of the products was \$220,746,000. The largest manufacturing industries consist of lumber mills, flour and grist mills, shipyards, iron works, paper mills, smelters, breweries, fruit and vegetable canneries, furniture factories, pottery and terra cotta works, creameries and condensed milk factories. Since 1900, manufacturing has increased very rapidly. Many new industries have been established and old ones have been greatly extended in order to keep pace with the growing markets. A careful estimate indicates that there has been an increase of at least 50 per cent since the census was taken. There are about 60 flour mills in the State, producing more than 2,000,000 barrels of flour per annum, which is marketed very largely in the countries of the Orient. Shipbuilding is carried on at a number of localities on Puget Sound and at Gray's Harbor. The Puget Sound Navy Yard and Moran Bros. Company's Works at Seattle, are equipped for the construction of all kinds of ships and boats. The battleship Nebraska was under construction in 1904 at the last named yard. Among the ship-building States, Washington stands fourth as to the number of vessels constructed, and tenth as to the volume of tonnage. A large proportion of the ship-building of the State is the construction of wooden sailing vessels and steamers of various types. The superiority of Washington fir for use in ship construction is recognized in all parts of the world, on account of its great strength and the length of clear timber obtainable. The manufacture of iron and steel has just been begun. One small blast furnace has been established on Puget Sound which produces a high grade of pig iron. With an abundance of raw materials, easily assembled at low prices, and with a large market for the product, the manufacture of iron and steel promises to become one of the leading industries of the State.

Nearly all of the rivers of the State are mountain streams, with a large flow of water at all seasons of the year, and many rapids and falls, which, under modern methods of transmission are capable of supplying power, for all industrial purposes, at a very low cost and in almost unlimited quantities. Large power plants have already been installed on the Snoqualmie and Puyallup rivers. The city of Seattle is constructing a plant upon the Cedar River, to supply the municipality with light and power for both public and private purposes. Several other plants are in the course of construction in the vicinity of the larger cities.

Transportation.—Washington is well pro-

vided with transportation facilities, both by water and by railroad. The rivers, lakes, Puget Sound with its numerous arms, bays and inlets; the Strait of Juan de Fuca and the Pacific Ocean, make all parts of the western section, and many parts of the eastern section of the State easily accessible by boats. There are about 2,700 miles of railroad in the State, not including the electric roads. The chief systems are the Northern Pacific, Great Northern, Oregon Railway and Navigation Company, Pacific Coast Company, Spokane Falls & Northern and the Bellingham Bay & British Columbia Railroad. The Burlington system and the Canadian Pacific also reach Puget Sound under a traffic arrangement with the other roads. Electric railways are now in operation from Seattle to Tacoma and to Renton. Another line is under construction from Seattle to Everett, and a number of other lines are projected.

A large fleet of steamers is operated upon the waters of Puget Sound carrying freight and passengers in the local traffic. Several steamship lines are operated between Seattle, Puget Sound and Alaska, British Columbia, California and the Orient, and between Gray's Harbor and San Francisco. In addition to the regular lines of steamships a large commerce is carried on by means of sailing vessels and itinerant steamships.

Commerce.—During the fiscal year ending 30 June 1910 vessels aggregating 1,806,467 tons entered, and vessels aggregating 2,063,152 tons, cleared in the foreign trade of the Puget Sound Customs District, which includes all of the ports of the State of Washington with the exception of the Columbia River. The value of the imports was \$53,074,271, and the value of the exports was \$32,911,480 in the Puget Sound, Seattle, and Tacoma Customs Districts. In 1893 the imports amounted to only \$830,709 and the exports to \$5,073,436. A very large commerce is carried on between Washington and the other Pacific Coast States, Alaska, Hawaii and the Philippine Islands, and the receipts in this trade average \$30,000,000 and the shipments \$40,000,000 per annum.

Education.—There are 2,407 school districts in the State, in 285 of which, schools of more than one department are maintained. In 1908, the total number of children of school age was 161,640 and the attendance at the schools was 198,214. The reports of the State superintendent of public instruction show that 6,524 teachers were employed. The amount expended for teachers' salaries, buildings and running expenses for 1908 was \$6,469,315. The value of all school property, exclusive of school lands, was \$7,700,000. The average length of the school sessions in the country districts is six months. In the towns and cities the sessions are usually ten months. Nearly every town of from 1,500 upward has a high school with a three or four year course. In a number of places several country districts have combined to form a union high school district. The number of students in attendance at high schools in 1909 exceeded 19,000. For higher education the State maintains the University of Washington, at Seattle, with 113 instructors and enrollment of 2,156 students; the Agricultural College and School of Science at Pullman, 49 instructors, 568 students; and Normal schools at Cheney, 12 instructors

WASHINGTON

198 students; Ellensburg, 11 instructors, and 145 students; and Bellingham, 20 instructors and 355 students. There are 34 private academies and colleges which reported to the State Superintendent in 1903, and a number of others which failed to report. The leading private colleges are Whitman College at Walla Walla; Whitworth College, Tacoma; Gonzaga College, Spokane; Puget Sound University, Tacoma; Vashon College, Burton, and Colfax College, Colfax.

Charitable, Reformatory and Penal Institutions.—The State maintains an institution for the care and education of the blind, deaf and feeble-minded; a reform school for juvenile offenders, a penitentiary; two hospitals for the insane and a soldiers' home. The school for defective youth is located at Vancouver and is properly divided into three branches, namely: for the deaf, the blind, and the feeble-minded. The reform school is located at Chehalis. This institution has a farm and shops of various kinds where boys and girls are taught useful trades. The penitentiary is located at Walla Walla. In this institution there is a jute mill and a brick yard which give employment to a large number of the inmates. The Western Washington hospital for the insane is located near Steilacoom, and the Eastern Washington hospital is located at Medical Lake. The soldiers' home is located at Orting. All of these State institutions are under the general supervision and management of a board consisting of three members appointed by the governor, known as the State Board of Control.

Banks and Finance.—There were in 1909 79 National, 152 State, 11 private banks, 8 savings banks, and 14 loan and trust companies; total, 257 banks. The assessed valuation of real and personal property in the State in 1909 was \$695,152,136, and the State tax levy \$3.50 per \$1,000.

Government.—The State officers are as follows: governor, lieutenant-governor, secretary of state, treasurer, auditor, attorney-general, superintendent of public instruction, and commissioner of public lands, who are elected for terms of four years. The legislature of the State has biennial sessions and consists of a Senate and House of Representatives. There are 42 members of the Senate, one half of whom are elected every two years to hold office for terms of four years. The House of Representatives consists of 94 members, elected biennially for terms of two years. The judicial department is divided into a supreme court and superior courts. There are five judges of the supreme court, whose terms are six years, and 25 judges of the superior courts, elected for terms of four years. The whole State is under county organization, the affairs of each county being administered by a board of county commissioners consisting of three members. The State is represented in Congress by two senators and three representatives.

Population and Divisions.—As shown by the United States census reports, the population of Washington was 11,594 in 1860; 23,955 in 1870; 75,116 in 1880; 349,390 in 1890, and 518,103 in 1900. The U. S. census for 1910 reported the population as 1,141,900.

There are 36 counties in the State which, with their county-seats, are named as follows:

Adams, Riverville.
Asotin, Asotin.
Benton, Prosser.
Chehalis, Montesano.
Chelan, Wenatchee.
Clallam, Port Angeles.
Clarke, Vancouver.
Columbia, Dayton.
Cowlitz, Kalama.
Douglas, Waterville.
Ferry, Republic.
Franklin, Pasco.
Garfield, Pomeroy.
Grant, Ephrata.
Island, Coupeville.
Jefferson, Port Townsend.
King, Seattle.
Knap, Port Orchard.
Kittitas, Ellensburg.

Klickitat, Goldendale.
Lewis, Chehalis.
Lincoln, Davenport.
Mason, Shelton.
Okanogan, Concomully.
Pacific, South Bend.
Pierce, Tacoma.
San Juan, Friday Harbor.
Skagit, Mt. Vernon.
Skamania, Stevenson.
Snohomish, Everett.
Spokane, Spokane.
Stevens, Colville.
Thurston, Olympia.
Wahkiakum, Cathlamet.
Walla Walla, Walla Walla.
Whatcom, Bellingham.
Whitman, Colfax.
Yakima, North Yakima.

There are 50 places in the State of over 1,000 population; 28 of over 2,000; 9 of over 5,000, and 5 of over 20,000. The metropolis is Seattle, on Puget Sound, with 237,194 inhabitants. Tacoma, 83,743; Spokane, 104,402; Bellingham (being Whatcom and Fairhaven, consolidated 1903), 24,208, and Everett, 24,814, are the other cities with more than 20,000 people. All of the cities named are important commercial and manufacturing centres.

Indians.—According to the Annual Report of the Commissioner of Indian Affairs there are 10,019 Indians living upon the 12 reservations in the State. The reservations contain 2,333,574 acres of land. The largest reservations are the Makaw and Quinault reservations on the Pacific Coast, the Tulalip and Puyallup reservations on Puget Sound and the Yakima, Colville and Spokane reservations in eastern Washington. There is also quite a large number of Indians who do not live upon the reservations. Many of them are engaged in agriculture, and a considerable number work in the logging camps and fisheries.

History.—The first record in history of the region which is now the State of Washington, was the discovery, in 1592, of the Strait of Juan de Fuca by a Greek pilot of that name in the service of the Viceroy of Mexico. In 1775, a Spanish navigator, Captain Bruno Hequeta, sailed along the coast and discovered the mouth of the Columbia, and was unable to enter the river. In 1792, Captain Robert Gray, a New England navigator, sailed up the North Pacific coast on a voyage of exploration and on 11 May, he discovered the mouth of the Columbia, sailed into the river, explored it for about 15 miles and gave it the name of his ship. It was this discovery and the exploration that gave the United States their strongest claim to the territory drained by the Columbia, which was known as the "Oregon Country." In the same year Captain George Vancouver of the British navy, explored the waters of Puget Sound. During the next few years, a number of other navigators visited the coast and it soon became quite well known. The first overland exploration was the expedition of Lewis and Clark of the United States army in 1805-6. This expedition, sent out by President Jefferson, traversed the Mississippi Valley, crossed the Rocky Mountains, and followed the Columbia River to its mouth, where they spent one winter. The next military expedition was that of 1843 under Captain John C. Frémont, which reached Vancouver on the Columbia. The first United States Naval Expedition was the exploration of Puget Sound by Captain Charles Wilkes in 1841. The first white

WASHINGTON

people to settle in Washington were the traders of the Northwest Fur Company, who established posts in eastern Washington in 1811. The next white settlement was established by Dr. Marcus Whitman in 1836, near the site of the present city of Walla Walla. The first settlement in western Washington was at Tumwater on Puget Sound, in 1845. The ownership of the country north of the Columbia River was claimed by both Great Britain and the United States until 1846, when, under the Buchanan-Pakingham treaty, Great Britain took all the territory north of the 49th parallel, and the United States all of the territory south of that parallel, except the south end of Vancouver Island. The American territory was organized as the Territory of Oregon, 14 Aug. 1848. On 2 March 1853, that portion lying north of the Columbia River and the 46th parallel was organized as the Territory of Washington. With the discovery of gold in eastern Washington, a great increase of population followed, and the Indians becoming alarmed for their hunting grounds, resolved to exterminate the whites. This led to the Indian war of 1855-6, and there were still further troubles with the Indians in 1857, at the time of the rush to the gold fields of British Columbia, but the greatest rush was after the discovery of gold at Salmon River in 1860. At the time of the treaty between Great Britain and the United States in 1846, the 49th parallel had been accepted as the boundary to the channel between Vancouver Island and the mainland, and thence down that channel to the sea. In 1859 a dispute arose as to which channel was meant, and this was not settled until 1872, when the claims were referred to arbitration and decided by the German emperor in favor of the United States. On 22 Feb. 1880, Congress passed an enabling act providing for the admission of the State of Washington into the Union. The State Constitution was adopted and ratified by the people, at an election held 1 Oct. 1889, and on 11 Nov. 1889, in accordance with the provisions of the enabling act, the President of the United States proclaimed the admission of the State of Washington into the Union. There were 14 governors of the Territory, of whom Isaac I. Stevens was the first. In addition to his duties as governor, he had charge of the survey for a railroad route from the Mississippi River to the Pacific, and was also Superintendent of Indian Affairs for Washington. The first territorial legislature met at Olympia 27 Feb. 1854. Since her admission to the Union the State has had four governors, namely: Elisha P. Ferry, Rep. (1889-92); John J. McGraw, Rep. (1893-6); John R. Rogers, Dem. (1897-1901); Henry McBride, Rep. (1902-4). Governor Rogers died in office and was succeeded by Governor McBride, who was elected as lieutenant-governor.

The growth of the population of Washington was very slow until the advent of the first railroad in 1884, on account of its remoteness and the difficulty of reaching it from the Eastern States. Since that time the development of the country has been phenomenally rapid. The establishment of regular steamship lines between Puget Sound and the countries of the Orient, the trade which has grown up as a result of the great discoveries of gold in Alaska and the Yukon territory in 1897, and the development of commerce between this State and the new

island possessions in the Pacific Ocean, are some of the leading factors which have caused the wonderful progress of the past few years.

JAMES B. MEIKLE,

Secretary Seattle Chamber of Commerce.

Washington, Ark., town, county-seat of Hempstead County; on the Arkansas & Louisiana Railroad; about 110 miles southwest of Little Rock. It is in an agricultural region, and its industries are connected chiefly with farm products. It has considerable trade, especially in the shipments of grain, vegetables, cotton, and tobacco. Pop. about 1,000.

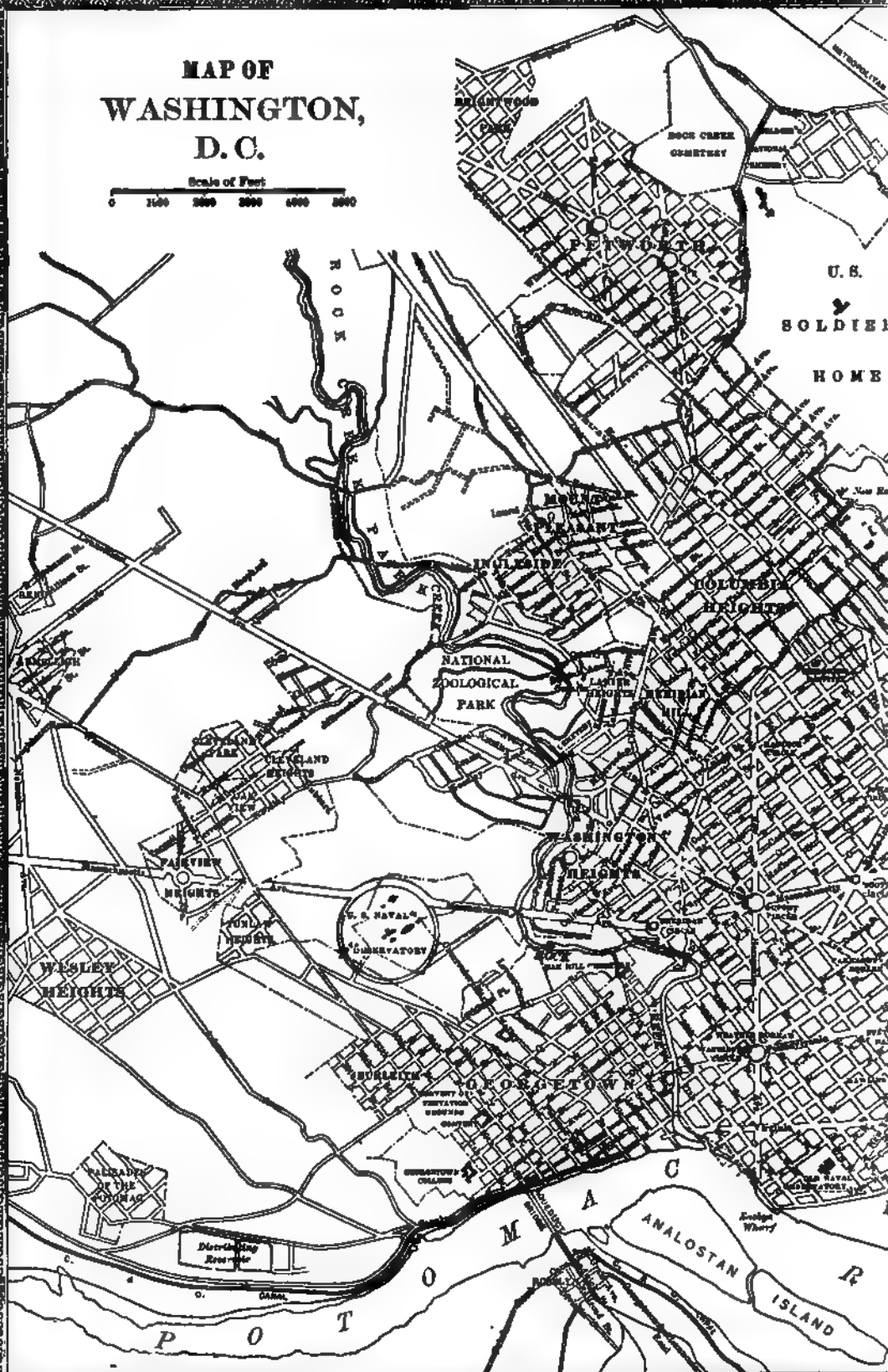
Washington, Conn., town in Litchfield County; on the Shepaug River; about 90 miles northeast of New York and 38 miles north of Bridgeport. It contains the villages of Marbledale, New Preston, Woodville, Washington, Washington Depot, and Romford. Its industries are connected with farm products and caring for guests in summer, as it is a favorite summer resort. Pop. (1890) 1,633; (1900) 1,820; (1910) 1,747.

Washington, D. C. The District of Columbia was established under the authority and direction of the acts of Congress approved 16 July 1790 and 3 March 1791, which were passed to give effect to a clause of the Constitution of the United States giving Congress the power: "To exercise exclusive legislation in all cases whatsoever over such district (not exceeding ten miles square) as may, by cession of particular States and the acceptance of Congress become the seat of the government of the United States." The territory obtained for this purpose lies in lat. 38° 53' to 38° N., lon. 76° 58' to 77° W. from Greenwich. Originally 10 miles square, with the southern and part of its western extremity in the State of Virginia, it, through recession of the territory received from that State, became reduced in area to 69¼ square miles made up of what was once a part of Maryland. The site of the District of Columbia is at the confluence of the Potomac and the Anacostia or Eastern Branch rivers, 100 miles from Chesapeake Bay and 185 miles from the Atlantic Ocean. It rises from tide water lowlands at the rivers' banks through a series of hills to an extreme elevation, in some sections, of 400 feet. The District, as it is constituted, in former times comprised the villages of Washington and Georgetown, both of which are now included in the great federal city of Washington, whose government is unique.

The President of the United States and the two houses of the Congress are to this city what the mayor and council are to other cities. The administration of municipal affairs is vested in three commissioners appointed by the President and acting under the sole authority of Congress. One half of the expenses of the government are paid from the revenues of the District and the other half by the United States. The assessed valuation of all the property in the District in 1910 was \$123,000,530. Ten years before, taxes were paid on \$213,250,418: \$264,156,956, more than one half of the total amount of the assessed valuation, was exempt from taxation because it is owned and controlled by the government of the United States. The appropriations for the expenses of the District for the fiscal year ending 30 June 1904 amounted to \$3,088,554.67, of which amount \$4,619,964.44 was paid from the

MAP OF WASHINGTON, D. C.

Scale of Feet
0 1000 2000 3000 4000





U.S.
SOLDIER

HOME



WASHINGTON

revenues of the District. The estimated population in 1902 was 289,596, including 200,477 whites and 89,119 negroes. The death rate for the same year was 19.986; 15.922 among the white people and 29.129 among the negroes. The birth rate for 1902 was 17.031; 15.393 among the whites and 20.714 among the negroes. The estimated population in 1903 was 295,193; white 204,840, negroes 90,353; pop. (1910) 331,069. The climate is excellent. The mean average annual temperature for 33 years being 55 degrees; average summer temperature for the same period, 75; average winter, 35. The city is reached by six railroad lines, the Pennsylvania, and Baltimore & Ohio, from the north and west, the Chesapeake & Ohio from the west, the Southern, Seaboard Air Line and Atlantic Coast Line from the south, and by steamboat from Baltimore on the north and Norfolk on the south.

History—By act of Congress in July 1790 a commission of three, with President George Washington at its head, was given authority to select on the Potomac River at some place between the mouth of the Eastern Branch and the Conococheague, a site, not to exceed 10 miles square, for a permanent capital of the United States. Within three days after the passage of the enabling act Washington announced the selection of the present site of the city which bears his name. The original acts of Congress relating to the District referred to it as the Seat of Government. Washington called it the Federal City, and the commission which had charge of it after the death of the first President knew it as the City of Washington in the Territory of Columbia. Congress finally accepted the name of Washington for the city and called the territory surrounding and including it, which was gained by cession from the States in which it lay, the District of Columbia. Major l'Enfant, a French engineer serving in the Continental army, who was employed to superintend the laying out of the city, followed plans outlined by Washington, derived, it is believed, from the outlines of Versailles, France. Washington and l'Enfant frequently rode over the site of the city together and the plans they decided upon were afterward developed and carried out, as far as they could be, by Andrew Ellicott, a Pennsylvania engineer, who was employed on the work after l'Enfant—thoroughly discouraged because of obstacles placed in his way by unsympathetic commissioners—had resigned his position. The scheme of the city as originally decided upon, made the Capitol building, located on the western edge of a high plateau, the point from which most of the streets and avenues radiated. Straight lines run through the centre of the building, north and south, east and west, divided the city into four sections known respectively as northwest, northeast, southwest and southeast. The streets were run with practically unswerving accuracy parallel to the marks of division, those streets running east and west being lettered and those north and south numbered. The avenues were planned to intersect the streets at various angles. The streets which followed the dividing lines were known as North Capitol, East Capitol and South Capitol; the western line running through a great expanse of parking directly to the Potomac River from the Capitol. This parking reservation, or series of parks, was called the Mall and was designed to be the most beautiful

section of the city, with the public buildings erected along the northern and southern sides. The cornerstone of the Capitol building, the first public edifice to be erected, was laid 18 Sept. 1793. The seat of government was removed from Philadelphia in 1800, and in November of that year the national legislature met in Washington for the first time. At the outset Congress placed city affairs in the hands of three commissioners; but, not pleased with the results of the experiment, in 1802 the city of Washington was made a corporate town with a mayor, a board of aldermen and a common council. The first mayor was appointed by the President, but all the later incumbents of the mayoralty were elected to office by the people. Georgetown and Alexandria, towns which existed prior to the Revolution, and which were included in the Federal District when that was originally laid out, remained corporate towns with independent municipal governments. In 1814 the city was captured by an expeditionary force of British soldiers and all the public buildings, including the Capitol and the White House, were destroyed by fire. During the first 70 years of its existence as the capital of the United States, Washington was apparently nothing more than one of the most forlorn of villages. No serious effort was made toward ordinary municipal betterment. The United States paid no taxes on the property it held and only made the smallest appropriations for maintenance of the capital city. This lack of public spirit lost to the District the Virginia territory which was ceded to that State on the petition of the citizens of Alexandria in 1846. The creation of a territorial form of government in 1871 which brought the whole District under Federal control again marked the beginning of the era of improvement which is even now progressing. The board of public works, established coincident with the creation of the territorial government, originated and pushed the great public improvements despite the obstacles it faced in the shape of the prejudices of the people. The city was cleaned and renovated; those lines of the Washington-l'Enfant plans which had been ignored or obliterated were re-established and the foundations of the Washington of to-day were laid. The city was left in such a state that when the present form of government was adopted the work was continued as an absolute necessity. Dissatisfaction with the territorial government developed, however, and after experimenting four years the present system was finally established by an act of Congress on 11 June 1878.

Government and Relations with the General Government—The District of Columbia now enjoys a unique form of government which is seemingly at variance with all republican principles and yet which reflects, as does nothing else in the United States the idea of a "government for the people, of the people, and by the people." The citizens of the United States rule their capital city. The people of the capital have no part in it. Three commissioners, one from each of the two dominant political parties and one an officer of the engineer corps of the army, are appointed by the President, with the "advice and consent of the Senate," to administer the affairs of the District for terms of three years each. These officials are paid \$5,000 per year for their work. The salary of the engineer

WASHINGTON

officer detailed for the work is made to equal this amount by additions to his regular pay. All subordinate officers of the government are appointed by the commissioners. Two assistants from the corps of engineers of the army are detailed with the engineer commissioner. The other members of the triumvirate have no assistants. There are two sets of laws in force. One, acts of Congress, corresponding to State laws in other communities; two, municipal regulations enacted by the board of commissioners, taking the place of the municipal laws of other cities. The commissioners have no power to appropriate the money used in the government. Every cent is appropriated specifically by Congress. An annual report is made to the Congress through the President, which contains the annual report of all subordinate officers of the government. The Congress determines upon all public improvements, through committees of each house appointed for the purpose. Nothing can be done, not even so little a thing as the purchase of a box of friction matches, without authority from the Congress. The expenses of the District government are paid, one half from the revenues of the District and one half from the treasury of the United States. The revenues of the District are derived from taxes on real and personal property and licenses of various sorts. The levying of the taxes is in the hands of an assessor who has subordinate to him a board of assistant assessors and a board of personal tax assessors, together with such license clerks, etc., as are necessary to carry on this part of the business of the government. A collector of taxes has charge of the collection of all taxes and license fees. The accounts are audited by an auditor who has an assistant and a large force of bookkeepers, accountants, etc. The police power is vested in a police department consisting of one major and superintendent, one captain and assistant superintendent, four captains and aids to the superintendent, 10 lieutenants who have direct control of the policemen, 35 sergeants, and 642 privates. The city is divided into 10 police precincts, each presided over by a lieutenant. The judiciary of the District includes one supreme court, a court of appeals and a police court. The supreme court of the District includes one chief justice, five associate justices, and one United States marshal. It is so divided into criminal, equity, circuit and probate courts that it transacts in this jurisdiction the same business as that which is accomplished by the Federal, State and municipal courts of other localities, the members of the bench alternating in the various branches. The court of appeals has one chief justice and two associate justices. This court hears appeals from the District supreme court and also from the commissioner of patents. The police court consists of two branches, each presided over by a police justice. One branch attends to violations of the municipal regulations and the other to infractions of United States laws. In all the courts, but the last named, the justices are appointed by the President for life terms. In the police court the justices are appointed for terms of four years each. Connected with the supreme court there is a register of wills and a recorder of deeds. The maintenance of true lines of streets, etc., is charged to the surveyor's office, which includes in its force one surveyor and his assistants, all under the control of the

engineer commissioner. The sanitation of the city is under the charge of a health officer who has a deputy and numerous inspectors. A superintendent of street cleaning, assisted in the work by about 400 men, has charge of the cleaning of the streets, much of which is done by the hand cleaning system. The city fire department consists of one chief engineer, four assistants, one fire marshal, one machinist, 14 steam engine companies, five chemical engine companies and six truck companies, each of the detachments or companies being under the control of a foreman and one assistant. There is an engineer department under the direct control of the engineer commissioner. The divisions of city government enumerated above, together with the other subordinate departments, are presided over by the two civilian commissioners, each having his special departments for control and observation. It requires, however, a majority vote of the whole board to determine any question of policy in carrying out the acts of Congress relating to the District. The Congress exercises a most jealous care of the District. Its appropriations are made separate and distinct for every department of the municipal structure, the smallest items being provided for specifically. In addition to going through the hands of the auditor for the District they are carefully scrutinized by the auditor for the State and other departments and the comptroller of the treasury. All money is disbursed by an officer appointed for the purpose by the commissioners. This officer has no connection with any of the other departments. A handsome municipal building for housing all branches of the city government is now (1904) about to be constructed at a cost of \$1,500,000. The water supply of the District comes from the Potomac River at a point about 15 miles above the city. It is carried through an aqueduct from the river to large storage reservoirs and from these is pumped into the city. A filtration plant is under construction near Soldiers' Home, which will cover 29 acres of ground and will be sufficient to filter all the water used in the city. The water is of excellent quality, free from impurities, although at times it is very muddy. It is drawn from the mountain streams of the Alleghenies which empty into the Potomac in the Cumberland Valley. The water supply with everything relating to it is under the charge of the United States government, by which it is owned. A nominal water rent is charged consumers.

Education.—The public school system of the District is said to be the finest in the United States. It is under the control of the commissioners through a board of education composed of seven members. The administration of the affairs of the schools is all in the hands of this board, which is made up of prominent citizens who receive a nominal fee or salary. The head of the system is a superintendent, aided by two assistant superintendents who report to him and perform such duties as he assigns. There is a secretary who is the official representative of the board. The board makes requisition upon the commissioners for all expenditures. These must be approved by the commissioners, who also make all contracts for school supplies, the purchase of sites, and erection of buildings. The school system includes eight grades of primary and grammar schools and a high school course

WASHINGTON.

1. The Capitol.

2. The White House.

WASHINGTON, D. C.

GROWING VIOLETS IN THE WHITE HOUSE HOTHOUSE



WASHINGTON

with military instruction for the boys. At the end of his work in the graded schools a pupil may elect either an academic, a scientific, a business or a technical course in the secondary schools. After passing through four years in the academic high school a pupil may prepare himself for appointment as a teacher by a two years' course in the normal school. The total enrolment for the school year 1903-4 was 48,745, of which 32,987 were white pupils and 15,758 were colored. These pupils were enrolled in 1,023 schools divided as follows: normal, 170; high schools, 2,673; manual training schools, 816; grammar and primary schools, 43,310; kindergarten, 1,776. During the fiscal year ending 30 June 1904 the appropriation for the public schools was \$1,222,283.90. The enrolment for that year was 48,432, making the cost per pupil \$25.23. During the same year the number of teachers employed in the schools was 1,391 and the number of schools 983. Washington is also the seat of many universities, colleges, seminaries, academies and private primary schools. The Catholic University of America is situated in one of the northern suburbs of the District near the head of Lincoln Avenue. This institution was first organized in 1865 under the direction of the Catholic hierarchy of America, but was not actually established until the fall of 1889. It is one of the foremost institutions in the country for the study of the advanced branches of science and philosophy. The oldest institution of learning in the District is the Georgetown University, founded by Archbishop Carroll of Baltimore in 1789 and conducted under the direction of the Jesuit Order of the Roman Catholic Church. This University occupies a magnificent park on the heights above Georgetown and has all the departments of a modern university, with its law and medical schools located in the down town section of Washington. Connected with the medical school is a well equipped, modern hospital, located in Georgetown near the university proper. The oldest college or seminary for women is the Georgetown Convent, established also by Bishop Carroll, in 1798. It receives young women of the Roman Catholic faith and educates them in all the higher branches of learning. It also receives novices for the orders of sisterhood. Howard University, established by an act of Congress in 1867 and supported almost entirely by the government, furnishes opportunities for an education to the negro. This institution has medical, dental and law departments as well as the regular academic course. It also fits young men for the ministry and has a preparatory department. The Presbyterian Church has had much to do with its development, although the government makes annual appropriations for its maintenance and for the maintenance of the Freedman's Hospital, in connection with which the university medical department is operated. The Columbian University was chartered in 1821 and up to 1904 was under the direction of the Baptist Church. The sectarian clause in its charter was removed by act of Congress during the early months of 1904 and at the same time the university was given permission to change its name. The new title is the "George Washington University." It has about 200 officers of government and instruction and includes all the departments of a well-equipped university: legal, medical, dental, scientific, and collegiate. In ad-

dition to these the institution established a few years ago a school of diplomacy and jurisprudence in connection with its law school, and a modern well-equipped hospital in conjunction with its medical department. Trinity College, a Roman Catholic institution situated near the Catholic University of America, was formally dedicated in November 1900. It was designed for the higher education of women and is conducted by the Sisters of Notre Dame de Namur. The new Academy of the Visitation, on Connecticut Avenue between L and M streets, was established in 1850 as an offshoot of the Georgetown Convent. It is designed for the education of girls and is one of the best schools in the District. The Academy of the Holy Cross, another Roman Catholic institution of learning, primarily planned for the education of little girls, was founded in 1868 and is under the charge of the Sisters of the Holy Cross. The Christian Brothers conduct the Saint John's College, an institution that instructs young boys in the lower branches of learning and prepares them for college. Gonzaga College, carried on in connection with the Society of Jesus, is one of the finest preparatory schools in the country. It has a battalion of cadets and a band, all composed of students. The National University was established about 1870, the intention being to create a national institution on the lines recommended by George Washington. This university has no collegiate course, but has schools of law, medicine, dentistry, and pharmacy. Recently the medical and dental branches became a part of the Columbian University. The Columbia Institution for the Deaf and Dumb, known also as Gallaudet College, was incorporated by Congress 15 Feb. 1857. Amos Kendall, a prominent citizen of the District and a well-known philanthropist, had much to do with its organization. It is situated in a beautiful locality in the extreme northeastern section of the city of Washington. The first superintendent was Edward Miner Gallaudet, whose son is now its president. The school for the deaf in connection with the institution is known as the Kendall School. The collegiate department is named Gallaudet College in honor of the Rev. Thomas Hopkins Gallaudet. Congress makes an annual appropriation for the maintenance of the institution. The American University, yet in the course of organization, under the direction of the Methodist Church, promises to be one of the finest institutions of its kind in the country. This organization owns a large tract of land in the suburbs near Tenleytown, where it already has one building in the course of construction. Washington is peculiarly situated regarding scientific institutions. The numerous government bureaus bring to the city a vast concourse of eminent men of science. The most important of these institutions are the naval observatory, the Smithsonian Institution (q.v.), the geological survey, the coast and geodetic survey, the public health and marine hospital service, the national bureau of standards, the various bureaus of the department of agriculture, and the museums and laboratories of the army and navy medical departments. All of these bureaus or offices pursue the study and development of special branches of science and their libraries are among the most valuable, on the subjects considered, in the world. Connected with the Smithsonian Institution is the

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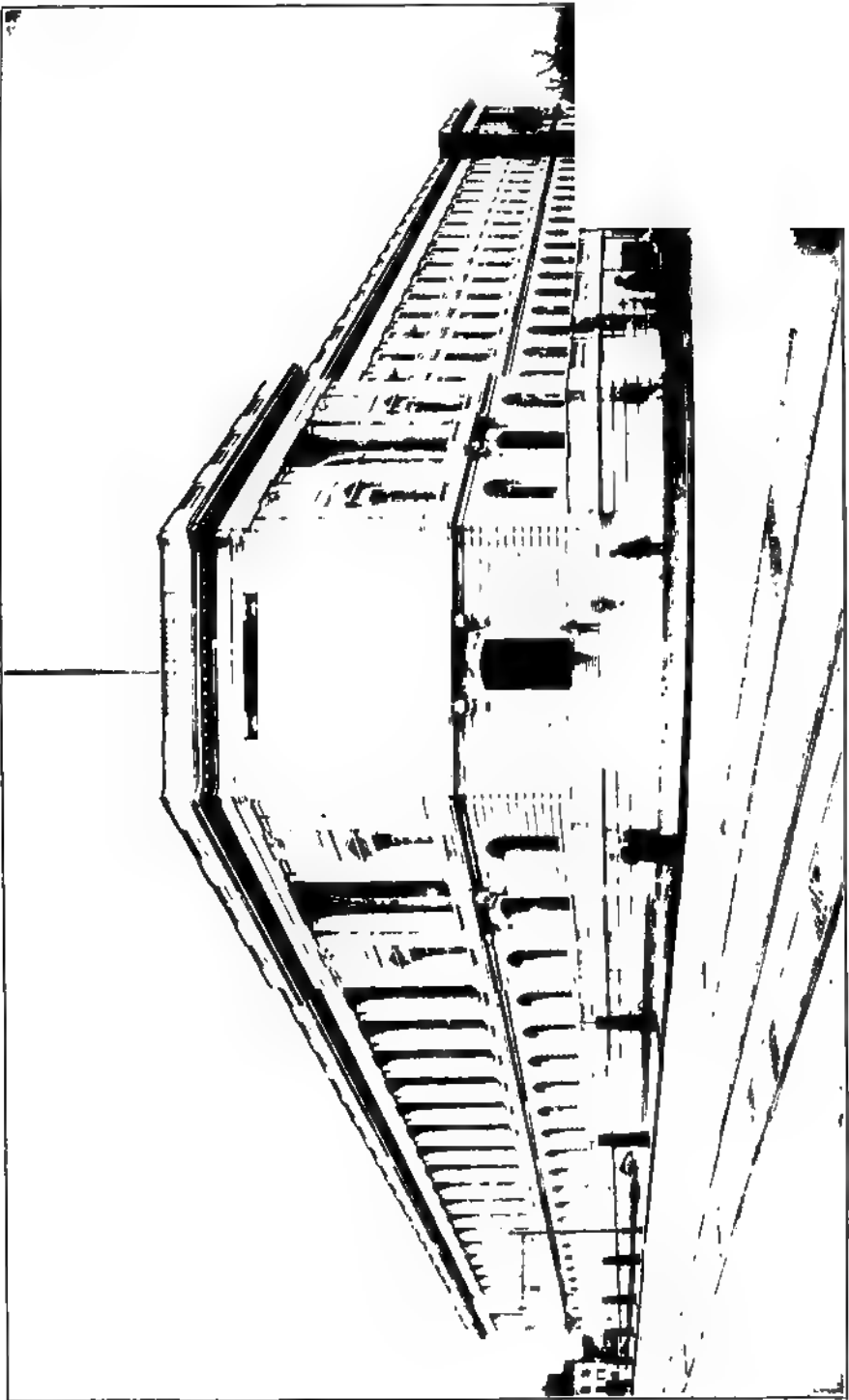
National Museum in which is gathered a collection of subjects relating to the various branches of the sciences and to the history of the United States. Each is presided over by an eminent master of science and each offers an almost limitless opportunity for research. For the benefit of those who desire to engage in study along any of these lines, but who have not the means to accomplish their desires, an institution has been established, known as the Carnegie Institute, to which Andrew Carnegie presented \$10,000,000 with which to carry on the work. Washington possesses a public library, through the munificence of Mr. Carnegie, which cost \$300,000. Mr. Carnegie has also given a sufficient sum for the purpose of establishing branch libraries. The Library of Congress (q.v.) forms, perhaps, the largest institution of its kind in the United States. It is open to all the people, and is especially patronized by residents of the District. The Corcoran Art Gallery, a handsome structure containing copies and originals of famous works of art from all sections of the world, is closely related to, yet independent of, the educational institutions of the government. In addition to the Library of Congress each department of the general government has its library and there are also valuable libraries connected with the army and navy medical museums, the former being the best of its kind in the world. The law library of the Bar Association of the District is a very valuable institution, situated in the City-Hall, where the District Supreme Court is housed. Each departmental library contains volumes relating particularly to the work of that department.

The peculiar conditions governing Washington physically have their effect on its moral government. The humane institutions of the Capital City are divided into three classes. First, those supported entirely by the combined general and local government; next, those supported partially by the same government combination; and third, those maintained solely by private means. In the first class are the Washington Asylum, including the work house, an institution for correction, and the alms house with a hospital to which the sick of both these institutions are sent; the Municipal Lodging House; the Soldiers and Sailors' Temporary Home; the Soldiers' Home; the Board of Children's Guardians, the Industrial Home; Freedman's Hospital for Negroes, and the Government Hospital for the Insane. In the second class are the Columbia Hospital for Women, Children's Hospital, National Homeopathic Hospital, Providence Hospital, Garfield Hospital, Central Dispensary and Emergency Hospital, Eastern Dispensary and Casualty Hospital, Woman's Clinic, Washington Home for the Incurables, National Association for the Relief of Destitute Colored Women and Children, Working Boys' Home and Children's Aid Association, Washington Hospital for Foundlings, St. Ann's Infant Asylum, German Orphan Asylum, Woman's Christian Association, Young Woman's Christian Home, Florence Crittenton Hope and Help Mission, Aid Association for the Blind, Woman's Dispensary. The third class includes many institutions and associations which have for their object the caring for sick and incapacitated persons. Under this head come the two university hospitals, Georgetown and Columbian, and several charitable organizations.

The Government Hospital for the Insane, including a tract of several hundred acres of land, is situated on the south bank of the Eastern Branch. The institution was primarily designed for insane soldiers and sailors of the United States, but it receives beside these indigent insane persons of the District of Columbia. This is regarded as one of the foremost institutions of its kind in the country. A superintendent, appointed by the Secretary of the Interior, reports to the Interior Department annually as to the progress and condition of the affairs of the institution. A board of visitors, composed of prominent citizens of the country, has indirect supervision over the hospital and its surroundings. The second largest public institution conducted by the government is the National Soldiers' Home, situated in the suburbs north of the city. This institution furnishes a home for the soldiers of the regular army after retirement either through age or disability. It is governed by a board of army officers. The 500 acres which it occupies are fitted up with a number of handsome buildings, among which is a well-equipped hospital, presided over by a surgeon of the regular army. Washington has numerous private charities and institutions for charitable purposes in connection with the various churches and religious organizations. The charities of the District are superintended by a board of prominent citizens known as the board of charities; appointments to this board are made by the President of the United States.

Streets, Avenues, and Parks—The wide streets and avenues and the numerous parks and parking spaces form the feature which most distinguishes Washington from other cities. Within the limits of the District there are 447.53 miles of paved streets of which amount 128.03 are asphalt and coal tar; 21.87 asphalt block; .52 vitrified brick; 27.34 granite block; 9.18 cobble stone; 71.36 macadam and 189.25 gravel. The gravel pavement is practically all in the parks and in the suburbs so that it cannot be taken as an indication of the treatment of the city streets. The mileage of asphalt streets is greater, it will be seen, than the mileage of all the other pavements, except gravel, put together. The distinctive feature is the slight use made of cobble stone in the pavements. Only 9.18 miles of street are paved in this manner and these are rapidly giving way to asphalt or asphalt block. The system of streets laid out by Washington, l'Enfant and Ellicott has been strictly adhered to. There are 21 avenues named after the various States. The streets and avenues are never less than 60 feet wide and vary from 60 feet to 160. Pennsylvania Avenue, which is the broadest street, is paved with asphalt almost its entire length, from the Eastern Branch to Rock Creek. Much of the property controlled by the United States is in public parks. Wherever an avenue intersects a numbered or lettered street the space between the avenue and street intersected, often an entire block in length, is converted into a public park. Many of these small parks are equipped with fountains and shrubbery and in all of them flowers are grown in huge masses during the proper seasons. These are under the direction of the superintendent of public buildings and grounds, an officer of the engineer corps of the army. The largest park in the city proper is called the Mall, which extends for about a mile and a half

WASHINGTON, D. C.



OFFICE BUILDING, HOUSE OF REPRESENTATIVES.

WASHINGTON.

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1. House of Representatives

2. Senate Chamber

WASHINGTON

from the Capitol building to the Potomac River and from B Street south to B Street north, giving it a width of four city blocks. It contains 230 acres. In the L'Enfant plan it was intended to improve this park by making a long vista or avenue, extending from the (then proposed) Washington monument to the Capitol, on the order of the Versailles gardens. This has never been done although recommended from time to time by architects and artists. The most recent recommendation was that of a distinguished commission of architects known as the park commission, appointed by the chairman of the Senate Committee on the District of Columbia to study the treatment of the parks in the capitals of Europe and to prepare a report as to what could be done in Washington. This report was presented to Congress in 1902, and provides for the expenditure of \$100,000,000 and the purchase by the government of all the property lying between Pennsylvania Avenue and the Mall on the north and between Maryland Avenue and the Mall on the south. Indications are that the plans, with some modifications, will gradually be adopted. The grounds surrounding the Soldiers' Home and in Rock Creek Park are the most extensive public reservations in the District. The former park is lined and interlined with drives of every sort. In the summer these are made most delightful by the great variety of foliage of the trees and the care taken in the cultivation of flowers and shrubbery. The Rock Creek Park, a vast tract of 1,775.9 acres acquired by the government during the last 20 years, is designed for a great national park. The government's zoological collection finds a home in one corner of this tract, which extends from the city limits to the District line and through which flows Rock Creek. The government owns most of the land for a considerable width along Rock Creek from the District line to the point where it empties into the Potomac near the western extremity of the Mall and the plans of the park commission provide for a system of driveways which will eventually connect Rock Creek Park with the Capitol building. The government has in the course of improvement a large tract of land known as Potomac Park, including a great area which has been reclaimed by dredging from the flats along the western and southern river front. This property is rapidly yielding to improvements which will make it one of the finest parks in the world. The Mall is connected with the parking surrounding the White House, the Treasury and State departments, by a reservation known as the President's Park or White lot, lying directly north of the Washington Monument. At points where two or three streets and avenues intersect, a small circular bit of parking is created, and in the, too, statuary has a place. This is shown by Lafayette Park, opposite the White House; Lincoln Park, at 11th and East Capitol streets; Garfield Park, between Third and Sixth and D and E streets southeast; Scott Circle, Thomas Circle, McPherson Square, etc. The parking about the Capitol building is very extensive and highly improved. Statues of Washington, Chief Justice Marshall and Garfield are found in and about this park. Statues of Scott, Farragut, Thomas, McPherson, Lafayette, Reamebeau, Jackson, Washington, and many other famous soldiers and statesmen are found at various points throughout the city, in

a majority of cases in parking spaces named in honor of the men whose statues adorn them.

Commerce.—Washington's commercial interests are small. Manufacture is carried on in the city in a very limited degree, although a large sum of money is invested in plants and material and the value of the output is considerable. To a great extent the goods turned out are for home consumption only. The census report for 1900 shows that there are 518 manufacturing establishments with a total capital of \$30,553,000. In these establishments are employed 9,758 persons who are paid in wages \$6,835,000 annually. The raw materials used were valued at \$10,246,000 and the product was \$25,289,000. Fully 20 per cent of the manufacturing and mechanical industry of the District is the product of the government. The financial interests are much more important. Reports made to the comptroller of the treasury in April 1903 by the banks and trust companies of the District show that since 1894, although there is one less bank and one more trust company, the capital of the banks of Washington has more than doubled. The amount of money available in the local banks of Washington is given as \$53,041,445. In 1895, with 13 banks and three trust companies the capital was but a little over \$23,000,000. The real estate interests of the city are enormous. Investors from out of town control large blocks of property and there has, in times past, been much speculation. Over 50 per cent of the property is controlled by the United States government and its holdings are being increased from time to time as the demand for sites for public buildings increases. To the active speculation in real estate Washington owes the development of its handsome suburbs, both in the District and in the States immediately surrounding it. Aside from the manufacturing interests a vast business is carried on in its mercantile establishments. Washington has several modern department stores of the most advanced type. The business section of the city, from Sixth to Fifteenth streets, east and west, and from Pennsylvania Avenue to K Street, north and south, teems with life at all hours of the day. Most of the business is carried on in the northwestern quarter of the city, although there are small establishments in great number in every section.

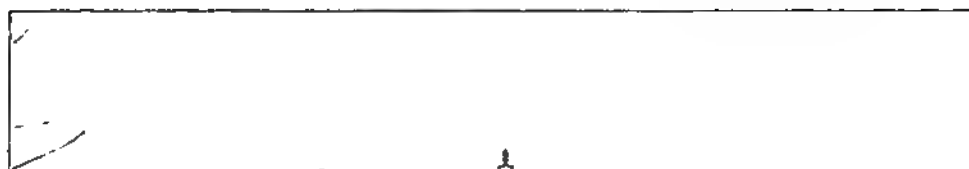
Transportation.—The street railroads have played no unimportant part in the development of the District. All of the street railroads within the heart of the city are operated on the underground electric system. This general adoption of the underground system is the result of legislation by Congress prohibiting the stringing of wires and the use of the overhead trolley within the city limits. There are but two railroad companies doing business in the District properly speaking. The largest of these, The Washington Railway & Electric Company, is a syndicate controlling the operation of eight of the smaller companies. It operates eight lines in the city and six lines in the suburbs. The other company, the Capital Traction Company, controls three lines operating on Pennsylvania Avenue, Seventh Street and Fourteenth Street respectively, with their branches and connections. The total street railway mileage in the District is 146.29 miles; 75.80 miles of which is double track underground electric; 9.93 miles is single track underground electric;

37.60 miles is double track overhead trolley; 2.06 miles is single track overhead trolley; all the overhead trolley lines are operated in the suburbs, and in several instances connect with related lines in Maryland and Virginia.

Public Buildings.—Because of the stringent building laws in the District the skyline of Washington will never be disfigured by tall office buildings. The law requires that no building shall exceed in height the width of the street on which it fronts. The public buildings are many and of fine architecture, as are also hundreds of the private residences. The largest and most important building is the Capitol, situated on a high plateau 88 feet above the level of the river. The central portion of the building was begun in 1793; in September of which year the corner stone was laid by President Washington. This part of the structure is built of sandstone quarried on Aqua Creek, Va., a few miles below Washington, and cost up to 1827, \$2,433,844.13, which included the expenditures made necessary by repairs after its destruction by the British on 24 Aug. 1814. The corner stone of the extensions or wings was laid 4 July 1851 by President Fillmore, Daniel Webster officiating as orator. These extensions were completed in 1859. The building is 751 feet 4 inches in breadth and 350 feet in depth. The area covered by the building is 153,112 square feet with a height from a base line at the east front of 287 feet 5 inches. The total cost of the Capitol building was about \$14,000,000. Next to the Capitol itself the Library of Congress is the most important structure in Washington. This was completed in 1897 and cost the government \$6,347,000. It contains the great national library and 45 miles of shelving, sufficient to hold 2,200,000 octavo volumes. In addition to the 1,415,475 books, papers, pamphlets and prints that are kept within its doors, the library has 178,140 other articles deposited for copyright purposes. The business of the library furnishes employment for 417 people and the last annual appropriation for its maintenance was \$768,845. The treasury department, at the corner of Fifteenth Street and Pennsylvania Avenue, the oldest of the departmental buildings, is constructed of freestone and granite in the Ionic style and cost \$7,000,000. On Pennsylvania Avenue between Eleventh and Twelfth streets is the new city post-office and post-office department. This building, constructed entirely of granite, occupies an entire block. It is one of the handsomest structures of the modern style of architecture. The State, War and Navy departments occupy a large granite structure built on the Renaissance style of architecture at the corner of Pennsylvania Avenue and Seventeenth Street. This building occupies more than four and a half acres and cost \$11,000,000. It is said to be the handsomest structure in Washington, excepting the Capitol and Library buildings. The building popularly known as the Patent Office, but which is really the secretary's office of the Interior Department, is a large structure of white marble of a pure Doric style. It cost \$3,000,000, and occupies the two blocks between Seventh and Ninth and F and G streets northwest. Opposite this building, fronting on F Street, is the old building of the post-office department, a structure built of marble in the Corinthian order of architecture, covering one block. This building is occupied

by the general land office and Indian bureau. The pension bureau is housed in an imposing brick structure in Judiciary Square, near the corner of Fifth and F streets northwest. Here have been held many of the great functions known as inaugural balls. The old city-hall building, now occupied by the District Supreme Court and Court of Appeals, is one of the old city buildings. It is situated in Judiciary Square fronting on D Street and Louisiana and Indiana avenues, at the head of Four and a Half Street or John Marshall Place. The home of the President, fronting on Pennsylvania Avenue, between the Treasury Department and the State, War and Navy building, is an artistically plain building of freestone painted white, from which it derives the name of White House. This was one of the buildings partially destroyed by fire in 1814 at the time the British burned the city. The offices of the President are contained in a low white building, built of brick, at the western extremity of a long colonnade extending from the White House. Directly south of the White House is the Washington Monument, a marble shaft 555 feet in height, to the building of which almost every country on the face of the earth contributed a stone. An elevator is run to the top of the building from which a fine view of Washington can be obtained. The Washington Public Library, the gift of Andrew Carnegie, occupies a parking space known as Mount Vernon Square, at the intersection of Seventh, Eighth, Ninth, and K streets and Massachusetts and New York avenues. This beautiful building was opened in 1902. On the south side of the Mall near Ninth Street is the Smithsonian Institution, a building of brownstone in the ancient Gothic style of architecture. It is one of the handsomest structures in the city and was built with money bequeathed by James Smithsonian, an Englishman. Adjoining it on the east is the National Museum, whose new building, which was built in 1905, cost in the neighborhood of \$4,000,000. Near the Museum are the Army Medical Museum and the Fish Commission buildings. To the west of the Smithsonian Institution is the building of the Department of Agriculture. Congress, in 1903, appropriated money for a new building for this department. Near the Department of Agriculture is the Bureau of Engraving and Printing, where all the paper money, stamps and bonds are made. The government printing office, the largest and most complete printing establishment in the world, is housed in a huge brick structure on the block bounded by North Capitol and First and G and H streets northwest. The large public buildings also include the naval observatory, the naval museum of hygiene and the coast survey buildings. New buildings are about to be constructed for the department of justice, for the Supreme Court of the United States, for the bureau of standards, and for the safe-keeping of government records. There is also in the process of construction a union station building which is to be one of the finest and most commodious of railroad terminals. It will cost about \$5,000,000 when finished and the approaches to it will cost about \$11,000,000. Part of the expense of changing grades, etc., is to be borne by the United States and District governments. There are many large buildings owned by private individuals or corporations which add to the architectural

WASHINGTON.



1. Congressional Library.

2. State, War and Navy Building.

WASHINGTON, D. C

A CORNER OF THE PERSIAN LEGATION.

WASHINGTON

beauty of the national capital. Among these are the *Evening Star* building, the Southern Railway building, the Lafayette Square Theatre, the New Willard Hotel, the Shoreham Hotel, the Cosmos Club, the Georgetown University, the Catholic University, the McKinley Manual Training School and the buildings of the Soldiers' Home.

Military.—Washington as the headquarters of the army and navy has three public reservations devoted exclusively to these branches of the public service. The most important of these is the navy yard, containing gun shops in which all the large guns for the vessels of the navy are made. Here also is a huge tank in which models of naval vessels are tested for speed, displacement, etc. Connected with the navy yard is a museum of arms and ordnance. Near the navy yard is situated the marine barracks, covering an area of two city blocks. The largest military reservation in or near the District is Fort Myer, originally established on the heights above Washington on the Virginia shore of the Potomac, as a post for the signal corps and named in honor of Gen. Myer, the officer who established the signal corps as a part of the army but who is better known for having established the weather bureau. At Fort Myer barracks and quarters are maintained for four troops of cavalry and two batteries of field artillery of the regular army. The reservation at Fort Myer adjoins the Arlington National Cemetery and includes a portion of the old Custis estate. In Washington is situated the Washington Barracks, now the seat of the Army War College and the School of Application for the engineer corps of the army. This is the oldest military post in this section of the country, having been established prior to the war of 1812 as an ordnance storage post. On this reservation the statue of Frederick the Great, the gift of the Emperor of Germany, was erected in October 1904. Here also is the site of the old military prison where the conspirators who were charged with complicity in the assassination of President Lincoln were tried, sentenced and those given the death penalty were executed. Near Washington are Forts Washington, Hunt and Foote, all of which are on the Potomac River below the city. The organized militia of the District of Columbia numbers about 1,700 men grouped into one brigade of two regiments and one separate battalion, including 28 companies of infantry; one battery of field artillery, one engineer corps, one signal corps, one ambulance corps and one naval battalion. The brigade is commanded by a brigadier-general who with his staff and all the line officers, are appointed by the President. The adjutant-general of the District militia is an officer of the regular army detailed by the War Department.

Churches.—Washington has some of the finest church buildings in the country; 17 sects are represented with 163 places of worship. The Episcopalians head the list with 31 churches; the Methodists have 27; Presbyterian, 22; Catholic, 17; Baptist, 16; Lutheran, 15; Methodist Episcopal South, 6; Methodist Protestant, 6; Congregational, 4; Christian (Campbellite), 4; Friends, 4; Reformed, 2; Hebrew, 2; Swedenborgian, Unitarian, United Brethren and Universalist, 1 each. In addition to these there are three organized societies of Christian Scientists; two Spiritualistic societies, one Pro-

gressive Brethren and two non-sectarian, the People's and the United States Christian. The aggregate membership in all these organizations is considerably over 60,000. The amount of property held by religious orders or organizations which is exempt from taxation and is used for religious purposes has an assessed valuation of \$6,405,702, this, in addition to the property held by such organizations for educational or charitable purposes, which is also exempt from taxation. The best known churches in Washington are the New York Avenue Presbyterian Church (Lincoln's Church), the Metropolitan Methodist Episcopal Church, attended by Presidents McKinley and Grant; the Church of the Covenant (President Harrison's church), the First Presbyterian Church (President Cleveland's church), and Saint John's Episcopal Church, the most fashionable church in Washington. To this list might also be added Grace Dutch Reformed Church, which President Roosevelt attends.

Cemeteries.—There are nine large cemeteries in or near the District. The largest is the Arlington National Cemetery, the old Custis estate on the Virginia side of the Potomac River overlooking the city. This is the magnificent estate owned by Gen. Robert E. Lee which was seized by the general government. The old mansion yet remains preserved in excellent condition. On the broad hillside sloping from the mansion to the river lie buried many of the soldier dead of the country, with Sheridan, Crook, Lawton, and Admiral Porter among the most prominent men whose last resting place this is. Here also can be found the graves of the men who perished in the Maine and many of those who died from wounds and disease in Cuba and the Philippines, together with the graves of thousands of Union and Confederate dead of the Civil War. At Soldiers' Home the inmates of the home are buried and many a veteran finds his last resting place here. Another national cemetery is that at the extreme end of Seventh Street road known as the Battle Ground Cemetery. Washington has but one crematory for the dead. In addition to the cemeteries included in the figures given above there are several devoted exclusively to negroes and one or two for the Hebrew dead.

Society.—The national capital is rapidly becoming the social and educational centre of the United States. Persons of great wealth from all sections of the country are flocking to the city during the sessions of Congress, many such persons having built large residences here. The city, as the focal point of governmental activity, attracts large numbers of people of all classes, making the social season one of great interest and activity. The clubs and theatres are among the best in the country. The most important clubs are the Army and Navy, Cosmos, Metropolitan, University, Alibi, Chevy Chase, and Country. The two last named are country clubs having handsome club houses in the suburbs. In addition to these there are a number of smaller clubs and club houses. There are seven theatres in the city.

Newspapers.—Almost every daily newspaper of consequence in the United States has an office in Washington, some of the largest papers supporting resident staffs with regular organization throughout the year, while others maintain correspondents during the sessions of Congress.

WASHINGTON

There are three large daily newspapers in Washington, the *Evening Star*, an afternoon paper owned by the Evening Star Newspaper Company, of which S. H. Kauffman is president and Crosby S. Noyes editor, the *Washington Post*, owned by the Washington Post Company, of which Beriah Wilkins is the president and editor, and the *Washington Times*, owned by Frank A. Munsey. There are several weekly and monthly publications which enjoy a large circulation. Pop. (1910) 331,069. See also DISTRICT OF COLUMBIA.

GEORGE H. HARRIES,
Vice-Pres. Washington Railway & Electric Co.

Washington (D. C.), Early's Attempt on. On 13 June 1864 Gen. Early marched from Gaines' Mills, under orders from Gen. Lee, to attack and drive Gen. Hunter from the Shenandoah Valley and then cross into Maryland near Leesburg, or at or above Harper's Ferry, and threaten Washington, thus hoping to draw troops from Grant's army. Hunter's failure at Lynchburg (q.v.) and his retreat toward the Kanawha left the Shenandoah Valley open to the movement into Maryland, and 27 June Early concentrated his army at Staunton, moving next day down the valley and reaching Winchester 2 July. He broke the railroad west of Martinsburg, drove Gen. Sigel from that place 3 July and across the Potomac to Maryland Heights (q.v.), crossed the Potomac at Shepherdstown Ford, demonstrated on Sigel, then crossed South Mountain by Turner's, Fox's, and Crampton's Gaps and attacked and defeated Gen. Lew Wallace on the Monocacy (q.v.), 9 July, Wallace retiring on the Baltimore road, leaving open to Early the road to Washington. Early had under his command the four infantry divisions of Rodes, Ramseur, Gordon and Echols, Ransom's division of cavalry, and Long's three battalions of artillery, in all about 15,000 men and 50 guns. On the morning of 10 July Early marched on the direct road to Washington and bivouacked at night four miles north of Rockville. McCausland's cavalry brigade, which had preceded him, drove from and beyond Rockville, about 600 Union cavalry, under command of Maj. Fry, of the 16th Pennsylvania cavalry. During these movements, from the time of entering Maryland, the Confederate cavalry was industriously engaged in gathering up horses, sheep, hogs, and cattle of all kinds, grain, bacon, and subsistence of every kind, and shoes and clothing. The live stock was driven across the Potomac. Bradley T. Johnson's cavalry brigade, moving from Frederick toward Baltimore, occupied several towns on the way and destroyed the Northern Central Railroad at Cockeysville. Another cavalry detachment stopped a train of cars at Magnolia Station, on the Baltimore & Ohio Railroad, and burned the train and Gunpowder River bridge. Wires were cut and communication with the north severed. At dawn, 11 July, Early marched through Rockville, McCausland, who had the advance, took the Georgetown road and by 9 o'clock was stopped by Col. Lowell, with a small cavalry force, in advance of Fort Reno. He formed Early's right. The main force, preceded by Imboden's cavalry brigade, marched for the Seventh Street road, running past Silver Spring, while Jackson's cavalry brigade moved on the left flank. Imboden's cavalry drove a small body of Union cavalry into the works on

the Seventh Street road and, dismounting, deployed as skirmishers. Early rode ahead of his infantry and arriving in front of Fort Stevens at noon, discovered that the works were but feebly manned. The northern defenses of Washington consisted of a series of detached works, at intervals of 800 to 1,000 yards, generally connected by rifle-pits, and mounting 400 heavy guns with a large range of fire. The one in Early's front, west of Seventh Street road, was Fort Stevens, with Fort De Russy on its left, from which it was separated by a deep ravine, through which ran Rock Creek, the one on the right was Fort Slocum. Fort Stevens had been furnished with a powerful armament, mostly of siege guns, well protected by embrasures and traverses. It had an extensive bomb-proof; and a hollow in the rear was capable of sheltering large bodies of men from artillery fire. Gen. Augur, commanding the defenses, had collected some heavy artillerymen, and a miscellaneous force of militia, convalescents, invalid corps, marines and sailors, department clerks and other employees of the government, and placed them under command of Gen. A. McD. McCook. The whole force, prior to the arrival of the Sixth corps, numbered about 8,000 men. The line immediately north of the city was garrisoned chiefly by the 150th and 151st Ohio regiments of 100 days' men, two or three companies in each fort, and by detachments of volunteer artillery of Gen. M. D. Hardin's division of the Twenty-second corps, whose two brigades held the entire line of sixteen forts from the Potomac, above Chain Bridge, to the Eastern branch. The cavalry, under command of Col. Lowell, consisted of detachments of the 2d Massachusetts, 8th Illinois, and 16th Pennsylvania, in all about 1,000 men, and was in advance of the works from the Potomac to Fort Stevens. When Early, who was within sight of the dome of the capitol, had seen the works, thought to be feebly manned, he ordered Rodes' division into line, in front of Fort Stevens, and, about 1.30 p.m. when the skirmishers were within range, the Union artillery in Fort Stevens, under Capt. Dupont, opened a rapid fire, clouds of dust appeared rising behind the fort, and soon a Union column was seen—a body of quartermasters' employees and 600 dismounted cavalry, under Maj. G. G. Briggs of the 7th Michigan, filing into the works on the right and left of the fort, whose skirmishers advanced to the front, before whom those of Rodes fell back, after approaching within musketry range of Fort Stevens and wounding men on its parapet. This dashed Early's hope of getting possession of the works by surprise and he consumed the rest of the day in reconnoitering. Meanwhile a substantial and timely reinforcement had arrived to strengthen the Union defense. Gen. Grant had doubted whether Early had anything more than cavalry in Maryland, but had sent Ricketts' division to Baltimore, and, on the night of the 9th, a few hours after Wallace's defeat on the Monocacy, ordered Gen. Wright, commanding the Sixth corps, to march his other two divisions from the lines before Petersburg to City Point, 14 miles, where he arrived at daylight of the 10th, took transports and by 2 p.m. of the 11th arrived at Washington, where, just arrived, was a steamer with 800 men of the Nineteenth corps, who, having reached Hampton Roads from New Orleans, had been sent directly

WASHINGTON

to Washington. President Lincoln was on the wharf to greet the troops on their arrival. Wright quickly landed his troops and marched them to near Fort Stevens, where he bivouacked, sending 900 men to relieve those that had been thrown out in front of Fort Stevens; being old soldiers, they immediately intrenched. Late in the evening 1,500 quartermasters' employees, and 2,800 convalescents, under Col. Frank Price, from nearly every regiment in the Army of the Potomac, took position in rear of Fort Slocum, and in the rifle-pits on either side of it.

After nightfall Early called a council of his division commanders, and a conclusion was arrived at to assault the Union lines at daybreak next morning, the 12th, but, during the night a dispatch was received from Bradley T. Johnson, near Baltimore, that two corps had arrived from Grant's army, and this caused Early to delay the attack until he could again examine the works. As soon as it was light enough to see he rode to the front and saw that the works were lined with troops, and gave up the idea of capturing Washington, but decided to remain in front of the works during the day and retire at night.

At dawn of the 12th Early was seen in position, with part of his command, at the Rives House, on the right of Silver Spring road, on rising ground, surrounded by shade trees, with an orchard near, giving cover to sharpshooters, who commanded the Union skirmish line from this point and also from McLay's House on the left of the road. Wheaton's brigade of the Sixth corps was thrown out on the skirmish line in front of Fort Stevens and instantly the Confederate sharpshooters began their work. Skirmishing continued until the middle of the afternoon, when Wright pushed out Bidwell's brigade of the Sixth corps, formed in two lines with orders to join Wheaton in an attack upon the Confederates at the Rives House. The guns of Fort Stevens and Fort Slocum opened a rapid fire and at a signal from Wright, who stood on the parapet of Fort Stevens, President Lincoln at his side, Bidwell moved forward, and with Wheaton's brigade, which formed an advance line, drove the Confederates from the Rives House and, after a sharp fight from rising ground beyond, and back for a mile upon Rodes' main line, where farther advance was stayed, but the skirmishing was kept up until late in the night, and the ground gained intrenched. The engagement was witnessed by cabinet officers, other officials and some ladies from behind the parapet of Fort Stevens, where also the President was ordered by Gen. Wright, when the engagement opened and men were being wounded on the parapet. The Union loss was over 200, of whom 150 were of Bidwell's brigade, including two regimental commanders of the brigade killed and others wounded.

On the left, near Fort Reno, Lovell's 900 cavalry had heavy skirmishing with McCausland's cavalry brigade, and drove it back on the Georgetown road until infantry came to McCausland's support. That night Early fell back through Rockville, marched all night and halted near Darnestown. Lovell's cavalry pushed after Early on the morning of the 13th as far as Rockville, where it was attacked and driven back by McCausland, with a loss of 30 killed and wounded, after taking 38 prisoners. At soon Wright marched after Early with two divi-

sions of the Sixth corps, followed by Emory's division of the Nineteenth corps. Early resumed his march from Darnestown and crossed the Potomac at White's Ford, near Leesburg, on the morning of the 14th, heavily laden with the spoils of war. The Union loss during the three days was between 350 and 450. Early left 30 dead and 70 wounded on the field and lost over 200 prisoners, not including his wounded. The loss on both sides was comparatively small, but the event is memorable in that it was the only occasion in the history of the country, where hostile armies met so near the seat of government, and men fell in battle within the boundaries of the District of Columbia. Consult: 'Official Records,' Vol. XXXVII; Early, 'The Last Year of the War for Independence'; The Century Company, 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Washington, Ga., village, county-seat of Wilkes County; on the Georgia Railroad; about 55 miles, in direct line, northwest of Augusta. It is the northern terminus of the Washington Branch Railroad (Georgia Railroad), which connects at Barnet with the main line. Mineral springs noted for their medicinal properties attract here many health-seekers. The surrounding country is devoted mainly to agriculture. The manufactures are flour and lumber products. The principal buildings are the county court-house, six churches, and the schools. It has a high school, opened in 1893, Saint Joseph's Academy (R. C.), public and parish schools, and Saint Joseph's Orphanage. There are two banks having a combined capital of \$112,000 and deposits amounting to \$241,000. Pop. (1890) 2,631; (1900) 3,300. The population of the town of Washington, which is a part of the village in industrial and commercial life, is (1910) 3,065.

Washington, Ill., city in Tazewell County; on the Chicago & Alton, the Toledo, Peoria & Western, the Atchison, Topeka & Santa Fé R.R.'s; about 11 miles east of Peoria and 65 miles north of Springfield. It is in an agricultural region. It has wagon and carriage works, a furniture factory, flour mill, and grain elevators. There are a public high school, established in 1876, a public library, and two private banks. Pop. (1910) 1,590.

Washington, Ind., city, county-seat of Daviess County; on the Evansville & Indiana and the Baltimore & Ohio Southwestern R.R.'s, about 100 miles southwest of Indianapolis and 20 miles east of Vincennes. It is in an agricultural and coal-mining region, and in the near vicinity there are nine large coal mines. The chief manufacturing establishments are railroad shops, flour mills, foundry and machine shops. There are extensive shipments of coal, grain, live-stock, flour, and vegetables. The city has four banks which have a combined capital of \$165,000, and the two national banks have deposits amounting to \$836,860. It has a high school established in 1874, Saint Simon's Academy, public and parish schools, and a school library. Pop. (1910) 7,854.

Washington, Iowa, city, county-seat of Washington County; on the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific R.R.'s; about 70 miles southwest of Davenport and 50 miles northwest of Burlington. It is in an agricultural and stock-raising

WASHINGTON

region. The chief manufacturing establishments are wagon and carriage works, cob-pipe factory, pipe-organ factory, machine shops, and creameries. The principal public buildings are the county court-house, 12 churches, the schools, banks, and business blocks. It has a high school, opened in 1867, an academy, public and parish schools, and two libraries. The five banks, two national and three State, have a combined capital of \$300,000 and deposits amounting to \$1,667,730. Pop. (1910) 4,380.

Washington, Kan., city, county-seat of Washington County; on Mill Creek, and on the Chicago, Burlington & Quincy and the Missouri Pacific R.R.'s; about 90 miles northwest of Topeka. It is in an agricultural region, in which the principal products are wheat and corn. Stock-raising is given considerable attention. The industries are connected chiefly with the farm products and the shipment of live-stock. There are a high school, a Friends' Academy, two national banks, two private banks, and a private business school. Pop. (1890) 1,613; (1900) 1,575; (1910) 1,700.

Washington, La., town in Saint Landry Parish on the Bayou Courtableau, and on the Southern Pacific Railroad; about 168 miles northwest of New Orleans. It is at the head of navigation on the bayou, and has opportunities for shipping freight by water that make it a commercial centre for a large part of the parish. There are brick and tile works, a cotton twine and yarn factory, cotton mills, and a machine shop. The principal shipments are rice, cotton, sugar-cane, and corn. The State bank has a capital of \$50,000. Pop. (1890) 1,064; (1900) 1,197; (1910) 1,528.

Washington, Maine, town in Knox County; about 25 miles east by south of Augusta. It was incorporated in 1811 and called Putnam; in 1823 the name was changed to Washington. The town contains several villages, in all of which there are manufacturing interests; the principal manufactures are barrels, staves, headings, undertakers' supplies, cabinet work, and lumber. There are five churches, a high school, and district schools. Pop. (1910) 814.

Washington, Mo., city in Franklin County; on the Missouri River and on the Missouri Pacific Railroad; about 55 miles west of Saint Louis. It is in a fertile agricultural region. It has manufactures of lumber, flour, shoes, cob-pipes, leather, musical instruments, agricultural implements, and furniture. There are made extensive shipments of packed beef and pork, wheat and corn, and lumber products. There are six churches, public schools, Roman Catholic and Lutheran schools. The city has two banks, having a combined capital of \$75,000 and deposits amounting to \$786,630. Pop. (1910) 3,670.

Washington, N. J., borough in Warren County; on the Morris Canal, and on the Lackawanna Railroad, about 61 miles west of Newark, and 12 miles northeast of Easton, Pa. It is near the base of Scott Mountain, on the south side, and is in an agricultural region. The chief manufacturing establishments are piano and organ factories, silk mills, machine shops, and furniture factory. There are six churches, a high school, founded in 1882, public elemen-

tary schools, and a school library. There are two banks, having a combined capital of \$150,000 and deposits amounting to \$738,680. Pop. (1910) 3,567.

Washington, N. C., town, county-seat of Beaufort County; on the Pamlico River, and on the Atlantic Coast Line Railway, 103 miles northeast of Wilmington, N. C. It is at the head of navigation on the river, has freight connections by water with the Atlantic coast ports and the West Indies. There are grain elevators and large warehouses; the principal exports are fish, vegetables, flour, and fruit. The town also contains barrel and sash factories, lumber and planing mills, and steam cotton gins; oyster fishing is an important industry. There are two banks, one of which is a State Bank with \$50,000 capital. The town has a high school, founded in 1899, with a school library of about 1,400 volumes (in 1904). Pop. (1890) 3,545; (1900) 4,842; (1910) 6,211.

Washington (N. C.), Military Operations at. This place, on the lower Pamlico River, was taken possession of by Col. Stevenson, with a detachment of the 24th Massachusetts, on 21 March 1862, the Confederates having abandoned it on the approach of the Union gunboats conveying the troops. Stevenson returned the same day to Newbern, but the place was subsequently occupied by Union troops and early in September 1862 was held by a small force of cavalry and infantry, with a battery of four guns, under Col. E. E. Potter, 1st North Carolina (Union) infantry, supported by two gunboats lying in the stream. At early dawn, 6 September, Potter, with the greater part of his command, started for Plymouth, leaving but a small force in the place, when Col. S. D. Pool, at the head of five companies of North Carolina cavalry and mounted infantry, dashed into the town, surprised the company of artillery in the barracks and captured its four guns. Hearing the firing, Potter retraced his steps, and after a sharp fight of three hours, the gunboats assisting, he drove Pool out and followed him eight miles, taking some prisoners. The Union loss was 8 killed and 26 wounded; the Confederate loss, 13 killed and 57 wounded. During the action the magazine of the gunboat Pickett exploded, 19 men being killed and 6 wounded.

After Gen. D. H. Hill's failure on Newbern (q.v.), in the middle of March 1863, he moved against Washington, appearing before it on the 30th, and driving in the Union outposts. Gen. J. G. Foster, hearing of Hill's movement, left Newbern by steamer on the 29th, arriving at Washington early next morning, and assumed command of its garrison, consisting of about 1,200 men, with a battery of artillery. Gen. Lee had advised against an assault on the place, and Hill proceeded to invest it. Batteries were thrown up commanding the river and the roads leading to the town, and at the end of two days communication was cut off, except by venture-some parties, who ran past the water batteries, carrying ammunition and provisions in small boats. At daybreak 1 April the Confederates opened fire from a battery of Whitworth guns on the south side of the river, at Rodman's Point, 98 of the shots striking the gunboat Commodore Hull. Foster threw up batteries on the north side of the river to draw the fire away

WASHINGTON -- WASHINGTON AGRICULTURAL COLLEGE

from the gunboats, and ordered the troops that had followed him in transports from Newbern to be landed and attack the Confederate battery at Hill's point in the rear, while the gunboats engaged it in front, but the Union officer in immediate command of the troops, considering himself not strong enough for the purpose, made no effort. On 4 April the gunboat *Ceres* ran past the batteries with a good supply of ammunition. The siege progressed languidly until the 8th, when the Confederates opened and kept up a heavy fire at the gunboats and at Fort Hamilton, on the land side of the town, to which the fort did not reply for want of ammunition. On the 9th it was discovered that the Confederates had built four batteries to the right and in front of Fort Hamilton, and fortunately two small schooners ran the blockade during the day, with ammunition, with which it was supplied. After the failure to land troops and attack the battery at Hill's Point, transports conveyed them back to Newbern, and an expedition was organized to march from that place on Washington and take the Confederate line in rear. The expedition consisted of 15 regiments, numbering 7,000 men, and was under command of Gen. Spinola, who crossed Neuse River on the 7th and, reaching Blount's Creek, found Pettigrew's brigade so strongly intrenched that after a sharp engagement on the 9th at Blount's Mills he withdrew to Newbern. The Confederates continued their fire upon Fort Hamilton from the 10th to the 13th. Several ineffectual attempts had been made to relieve the garrison, when Col. H. T. Sisson offered to do it with his regiment, the 5th Rhode Island. The transport steamer *Escort* was protected by bales of hay on her guards and deck; the troops were put on board, and, sailing from Newbern, on the night of the 13th, ran past the batteries and up the river, with not a man injured, and landed a plentiful supply of ammunition and commissary stores, much to the chagrin of the Confederates. Next morning the 5th Rhode Island was placed on the line of works. On the morning of the 15th Foster, leaving Gen. Potter in command, returned on the *Escort* to Newbern to organize an expedition to raise the siege, but it was not necessary. Hill gave up the siege, and, on the night of the 15th fell back toward Greenville. Washington continued in Union possession until after the Confederate capture of Plymouth (q.v.), when Gen. Grant ordered the evacuation of the place, as it was of no strategic importance. It was finally abandoned 30 April 1864, and a great part of the town burned. Consult: 'Official Records,' Vol. IX., XVII., XXXIII.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Washington, Ohio, county-seat of Fayette County; on Paint Creek, and on the Baltimore & Ohio, the Ohio Southern, the Cincinnati & Muskingum Valley, and the Cincinnati, Hamilton & Dayton R.R.'s; about 75 miles northeast of Cincinnati and 30 miles southeast of Springfield. It is in an agricultural region. The industrial establishments are boot and shoe factories, soap factory, woolen mills, iron works, machine shop, planing mill, and flour mill. The government census of 1900 gives the number of manufacturing as 67. The four banks have a combined capital of \$300,000 and deposits amounting to

\$1,499,000. There are a public high school, graded elementary schools, a library, and private business schools. Pop. (1910) 7,277.

Washington, Pa., borough, county-seat of Washington County; on Chartiers Creek, and on the Pennsylvania, the Baltimore & Ohio, the Waynesburg & Washington R.R.'s; about 32 miles southwest of Pittsburgh. It is in an agricultural and coal region. The chief industrial establishments are tube and pipe works, steel works, tin plate and iron works, glass factories, petroleum works, machine shops, and foundries. The government census of 1900 gives 150 manufacturing establishments, which were capitalized for \$2,897,670, and in which were employed about 2,206 persons, to whom were paid annually \$1,052,616. The amount paid annually for raw material was \$2,303,113 and the value of the finished products was \$4,667,330. In January 1904 there were about 4,000 employees in the manufactories. The principal public buildings are the county court-house, erected in 1901, and which cost about \$1,250,000; the Washington Hospital, and the churches and schools. There are 27 churches, representing 13 different denominations. The educational institutions are Washington and Jefferson College, Washington and Jefferson Academy, Trinity Hall Military School, Washington Ladies' Seminary, Washington Business College, Practical Commercial College, 10 public schools, one Roman Catholic parish school, and the Citizens' Library. The six banks have a combined capital of \$1,650,000, and, excluding one private bank, the deposits amount to \$5,975,340 (January 1903). The government is administered by a burgess and council of 21 members.

Washington was first settled in 1768 by people from the northern part of Ireland. The place was incorporated as a borough in 1810; in 1901 the boroughs of North and South Washington consolidated with the borough of Washington. Pop. (1910) 18,778.

Washington Academy of Sciences, a society for the promotion of scientific learning, organized in 1898. It is an organization uniting a number of learned societies of the city, including the Anthropological Society, the Biological Society, the Geological Society, the National Geographic Society, the Medical Society of the District of Columbia, and the Philosophical Society. The last-mentioned, organized in 1871, is the oldest of the societies composing the academy. The academy and the majority of the separate societies publish 'Proceedings.'

Washington Agricultural College and School of Science (name changed to 'The State College of Washington') located at Pullman, Wash. It was founded in 1890 in pursuance of the national land grant act of 1862, endowing agricultural and mechanical colleges, and of the more recent national policy of endowing a school of applied science in the newer States; it was determined to unite the work of these two into one institution, of which, also the State agricultural experiment station is a part. The national government granted to the Agricultural College 90,000 acres of land, and to the School of Science 100,000 acres of land, the proceeds of the sale of which will constitute a permanent endowment for the institution. Women are admitted on equal terms with men.

WASHINGTON AND LEE UNIVERSITY

The regular courses are divided into the following departments: (1) Department of mathematics and civil engineering; (2) Department of chemistry; (3) Department of botany and zoology; (4) Department of agriculture; (5) Department of horticulture; (6) Department of English language and literature; (7) Department of economic science and history; (8) the department of mechanical engineering, including electrical engineering; (9) Department of modern languages; (10) Department of mining engineering; (11) Department of Geology; (12) Department of military science and tactics. There are also supplementary courses in physics, Latin, domestic economy and education, and the following special schools: the preparatory school, the school of agriculture, offering a three years' practical course co-ordinated with the work of the preparatory school; the school of dairying, with a special course of eight weeks; the school of pharmacy, offering a two years' course and conferring the degree of graduate in pharmacy; the school of veterinary science, offering a three years' course leading to the degree of doctor of veterinary science; the school of business, with a two years' course; the school for artisans, offering a practical mechanical course of two years. There are also a short course in horticulture, instruction in music, and a summer science school for teachers, offering both courses for advanced study and courses in scientific method and nature study for the elementary grades. The degrees of A. B. and B. S. are conferred for the completion of a four years' course in the regular departments; the study of military science is required of all male students; candidates for a degree must elect one of the other departments as major for the four years; in the more technical departments almost all the studies are required; in other departments a larger opportunity is given for election, especially in the junior and senior years. Students in any of the 11 departments may receive the degree of A. B.; those in any but the department of English language and literature and the department of modern languages, the degree of B. S. Graduate work is also provided. The buildings include the administration building, science hall, college hall, mechanical hall, Ferry hall (the dormitory for men, named for the first State governor of Washington), Stevens hall (the dormitory for women, named for the first Territorial governor), the mining building, Morrill hall (for the department of chemistry), the gymnasium and armory, the veterinary hospital, the greenhouse, the farm and dairy buildings. An infirmary was built in 1904. The scientific laboratories are well equipped with modern apparatus, the library in 1910 contained 23,000 volumes, in addition to which the experiment station library is open to students. The students in 1910 numbered 1,371, the faculty 110.

ENOCH A. BRYAN.
President.

Washington and Jefferson College, located at Washington, Pa. Three classical schools were conducted by three ministers near Washington, the earliest opened in 1780, and out of these schools grew the academies and colleges from which came the present institution. In 1787 an academy was founded at Washington under the leadership of three Presbyterian

ministers; in 1790 the court-house where the academy held its sessions was burned, and the academy suspended, some of its patrons in 1794 chartered a new academy at Canonsburg, and the opening of this school stimulated the reopening of the Washington Academy; the Canonsburg school was chartered as Jefferson College in 1802, and the Washington school as Washington College in 1806. Many attempts were made to unite the two institutions, but all failed until 1865, when the union was accomplished under the present name. Even then rivalry existed as to the location of the college, and a compromise was effected by having a part of the faculty and students at Canonsburg and the rest at Washington, in 1869, however, the college was definitely located at Washington. The control is vested in a self-perpetuating board of trustees of 31 members. The college offers three courses leading to degrees, the classical (with the degree of A. B.), the Latin scientific (degree of B. S.), and the French scientific (degree of B. S.). These three courses differ in the work of the first two years, and are alike in the last two, in having the same studies required and the same electives to choose from. There is also a course in civil engineering. To aid students preparing for the professions, courses are suggested preparatory to the study of theology, law, and medicine; Hebrew is included in the curriculum for the benefit of those studying for the ministry. There is also a preparatory department. There are seven scholarships endowed, and a large loan fund for students. The college occupies 16 acres within the limits of the town; a new library building, the latest addition to its equipment, was erected in 1903-4. The property and endowment of the college, including amounts pledged at the centennial celebration of 1902, amount in 1910 to considerably more than \$1,000,000. The students in 1910 numbered 407, and the faculty 21. The total number of alumni is 4,084, of which about 1,650 entered the ministry, 950 the law, and 460 the medical profession. Of the alumni who have obtained some distinction there have been 4 members of the cabinet, 11 governors of States, 10 United States senators, 70 presidents of colleges and universities, 20 State supreme court judges, 2 bishops of the Protestant Episcopal Church, and 28 moderators of General Assemblies.

JAMES D. MORFAT,
President.

Washington and Lee University, located at Lexington, Va. The beginning of the university was the foundation of Augusta Academy in Augusta County, Va., established by a body of Scotch Presbyterian settlers; this academy in 1780 was finally moved to Lexington, and in 1782 was chartered under the name of Liberty Hall Academy. This charter provided for a self-perpetuating board of trustees, thus taking the institution from the direct control of the Presbyterian Church. In 1796 the academy received a generous gift from Washington, and in 1798 the name was changed to Washington Academy. In 1802 the building was destroyed by fire, and the academy for several years suffered serious financial difficulties. When relieved from these embarrassments the curriculum was extended and the name changed in 1813 to Washington College. The college was closed

WASHINGTON COLLEGE—WASHINGTON UNIVERSITY

during the Civil War, the majority of its students joining the Confederate army. Its buildings were much damaged during the Federal occupation of Lexington, and about 30 years later it received a Congressional appropriation as remuneration for the damage. The college was reopened in 1865, with Robert E. Lee as president. He served till 1870, and during his administration the college grew rapidly in numbers and influence. A school of engineering was established, and the Lexington Law School (founded 1849) became a department of the college. In 1871, soon after the death of General Lee, the name of Washington and Lee University was adopted. The university organization includes three schools. (1) the School of Arts; (2) the School of Engineering; (3) the School of Law. In the School of Arts for the degree of A. B., the courses are arranged in three groups,—the language group, the English and history group, and the mathematics and science group. The work is entirely elective, with the restriction that a certain minimum of hours must be elected from each group. The degrees of A. M. and Ph. D. are conferred for graduate work. The School of Engineering offers three courses, in civil and mining engineering and chemistry; the degree of B. S. is conferred. The degree of LL. B. is conferred by the School of Law for a two years' course. Physical training is systematic and thorough, and a certain amount of regular gymnasium work may be credited toward the A. B. degree. There are 16 general scholarships in addition to high school scholarships for accredited schools, alumni association scholarships, and one law scholarship. The university is situated on gently sloping ground, the upper part of which extends toward the campus of the Virginia Military Institute (q. v.), with which it is connected by a short avenue. The buildings include the main building; the Lee chapel, in the crypt of which General Lee is buried; Newcomb hall (the library); Tucker hall (the law building); the chemical laboratory, the gymnasium; engineering hall, and two dormitories, one of which was completed in 1904. The library contained in 1910 about 50,000 volumes, including the law library. The students numbered 609 and the faculty, 42.

GEORGE H. DENNY,
President.

Washington College, located at Chestertown, Md. It was chartered as a college in 1782, being the oldest institution of collegiate grade in the State. It was the direct successor of an academy with which the Free School of Chestertown (founded in 1723) had been merged, and was established as a part of the proposed University of Maryland. General Washington gave his consent to the naming of the institution for him, and became one of the board of visitors. The college is non-sectarian, and receives an appropriation from the State. It is open to women. The college offers two collegiate courses, classical and scientific, each leading to the degree of A. B., a normal course, and a preparatory course of three years. There are no electives in the collegiate courses. The normal course extends over three years, the first year's work being the same as the last year of the preparatory course; the study of Latin after the first year is optional. Gymnasium work is a regular part of all courses. There are

a number of scholarships established by the State for both collegiate and normal courses. The buildings include the main building, normal hall (a dormitory for women, built by the State), and the gymnasium. The library in 1904 contained 5,000 volumes, the students numbered 119, and the faculty 10.

Washington College, located in Washington County, Tenn. It was chartered as an academy in 1783, and as a college in 1795, and was the first institution of higher learning west of the Alleghany Mountains. During the Civil War, and for a short time after the war, the resources of the college were seriously crippled, and only a course of academic grade was offered. Two thirds of the board of trustees must be Presbyterians, but the college is not otherwise under denominational control. Two college courses are offered, the classical leading to the degree of A. B., and the scientific leading to the degree of B. S. There are also courses in music and oratory, a preparatory department with an auxiliary department giving instruction in domestic science, and an industrial department (established in 1892-3) affording opportunity for students to pay a portion of their expenses by manual labor. The campus, consisting of 16 acres, occupies an elevated site, commanding a view of the surrounding mountains; the buildings are the recitation hall, the boys' dormitory, and the girls' dormitory. Salem Church is used as the college chapel. The students in 1910 numbered 140, of whom 100 were in the collegiate and preparatory courses.

Washington, Fort. See **FORT WASHINGTON**.

Washington, Mount, in New Hampshire, the highest peak of the White Mountains, and the highest point in the northeastern part of the United States. Its altitude is 6,293 feet; it is east of Crawford Notch. Granite is the chief rock formation of the whole mass. On the east side there are many deep gorges, and several on the north; on the west the slope is steep. The summit is rocky, with scanty vegetation compared with the lower slopes and base, where large trees are numerous. For many years a carriage road has extended to the top, and since 1869 a rack-and-pinion road has enabled tourists to ascend to the summit with ease. A United States meteorological station and a large hotel are on the summit.

Washington, Treaty of, a treaty between Great Britain and the United States, signed 8 May 1871. Under its terms the Alabama claims, the San Juan boundaries, and certain fisheries disputes were settled by arbitration. See **TREATIES**.

Washington University, located at Saint Louis, Mo. It was founded in 1853, and is a non-sectarian institution, being under the control of a self-perpetuating board of trustees of 17 members. Besides the Collegiate Department, there are engineering, law, art, and medical departments. The college confers the degree of A. B., the course is largely elective, the work of the junior and senior years entirely so; the Engineering Department offers courses in civil, mechanical, electrical, and chemical engineering, and architecture, and confers the degree of B. S. For graduate work the university confers the degrees of A. M., M. S., Ph. D., and the professional degrees of civil, mechanical,

WASHINGTON, UNIVERSITY OF—WASPE

electrical, and chemical engineer after not less than three years of successful active practice. The productive funds of the university in 1910 amounted to \$7,000,000; the library contained 110,000 volumes; the students numbered 1,024, and the faculty 145. See also SAINT LOUIS—Education.

Washington, University of, the State university located at Seattle, Wash. The first steps toward the establishing of the university were taken by the first territorial legislature in 1854, which petitioned Congress for a grant of land; an appropriation of two townships was shortly afterward made by Congress. In 1855 the legislature organized the Territorial University of Washington in two equal institutions, one located at Seattle, the other on Boisfort Plains, Lewis County; but as no further steps were taken toward the establishing of the university, the legislature united the two institutions and fixed the location in Cowlitz Farm Prairie, Lewis County. This shifting policy led the people of Puget Sound region to incorporate another university, and the fear of thus duplicating institutions led the legislature to definitely fix the location of the University of Washington at Seattle, and to appoint a board of commissioners to select and sell the granted lands and establish the university. The main building was completed in 1862, and the university opened to students in the same year. In its earlier years the university met with many difficulties, chiefly financial, as the Territory appropriated no money for its maintenance until 1879; its progress was slow until 1893, when the legislature provided a new site and appropriation for building purposes. Since that time the growth of the university has been both continuous and rapid, and it has taken its place as the real head of the educational system of the State. It is open to all without charge for tuition, except in the School of Law. The board of regents consists of seven members appointed by the governor with the approval of the Senate, for a term of six years. The university includes the following schools: (1) The College of Liberal Arts; (2) the College of Engineering; (3) the School of Mines; (4) the School of Pharmacy; (5) the School of Law. The College of Liberal Arts offers a classical, a literary, and a scientific course, all leading to the degree of A.B. In each course half the work is elective; the electives include a major study, selected at the beginning of the junior year. Most of the elective work falls in the last two years, but there is some in the sophomore year, and in the freshmen year of the literary and scientific courses. A limited amount of gymnasium work is required for the degree. Courses in pedagogy are included in the curriculum. The degree of A.M. is conferred for graduate work. The College of Engineering offers four courses, civil, electrical, mechanical, and chemical engineering, leading to the degree of B.S. The degrees of C.E., E.E., and M.E. are conferred for graduate work. The School of Mines offers two courses leading to the degree of B.S., mining engineering, and geology and mining, and a short course in mining for prospectors. Graduate work is offered which leads to the degree of E.M. (engineer of mines). The School of Pharmacy has a two years' course leading to the degree of graduate

in pharmacy, and an advanced four years' course with the degree of B.S. The School of Law provides a two years' course which leads to the degree of LL.B., and admits to the State bar without further examination. The students maintain a general association which has charge of student government, debating clubs, a dramatic club, and several special associations for members of certain departments of study. Six Greek letter fraternities, and three sororities have chapters at the university. The university grounds comprise 355 acres lying between Lakes Union and Washington; the plan for the arrangement of the buildings is a modification of the quadrangle, all buildings being grouped around an ellipse, whose major axis is 1,200 feet and the minor axis 650 feet. All buildings are to be constructed of materials found in the State. The buildings erected in 1904 are the Administration Building, Science Hall, the observatory, the assay shop, two dormitories, one for men and one for women, and the gymnasium, containing separate exercise rooms, dressing rooms, and equipment, for men and women. The scientific laboratories are well equipped with modern apparatus; the library in 1910 contained 42,000 volumes; in addition to which the university owns the library of the School of Law, 1,000 volumes, and a special library of American history, 350 volumes. The students numbered 2,156, besides a summer session enrollment of 114, of whom 509 were in the College of Liberal Arts, and the faculty 113.

THOMAS F. KANE,
President.

Washita, wosh'-ta, or Onachita, a river which rises in Polk County, Ark., and flows east then south into Louisiana, entering the Red River in the east central part of the State. The chief tributaries are Saline, La Fourche, Tensas, and Little Missouri. The part of the river below the point where the Tensas enters is often called the Black River. The Washita is navigable throughout the year as far as Camden, Ark., and for about eight months to Arkadelphia, Ark. The total length is about 600 miles.

Wash'o Indians, a linguistic stock of North American Indians, consisting of the Washo tribe, whose original range extended from Reno, on the line of the Central Pacific Railroad in western Nevada, to the lower end of Carson Valley. The vicinity of Carson is now the chief seat of the tribe and here and in the neighboring valleys there are about 200 living a parasitic life about the ranches and towns.

Wasps, hymenopterous insects, typically belonging to the family *Vespidae*, in which the head-shield is square and the mandibles or greater jaws short and toothed at their tips. The wings are folded once longitudinally when at rest. The antennæ of the males are 13-jointed, those of the females and neuters or workers 12-jointed. The abdomen is egg-shaped and often borne on the thorax by a slender stalk.

The true wasps differ considerably in appearance and greatly in habits. Some of them live in pairs and construct simple cells of mud which are attached to twigs, beneath stones, etc., and stored with paralyzed spiders and insects upon which the larvæ feed; others burrow

into the stems of plants or the ground and provide for the young in a similar manner. All such are known as solitary wasps, to distinguish them from the social or colonial wasps, and are sometimes separated as a distinct family (*Eumenidae*). The true social wasps are all paper-makers and their nests are sometimes of large size and shelter a great many individuals. Unlike the solitary wasps which are of perfect males and females only, the social wasps produce in addition a caste of "workers" or infertile females.

Eumenes fraternus is a well known solitary wasp, easily recognizable by the long and slender pedicel formed by the basal segment of the abdomen, the short square thorax, and long jaws. Its nests are dainty spheres about half an inch in diameter constructed of mud pellets and attached, often several in a row, to twigs or walls, and sealed after being provided with a fertilized egg and a supply of caterpillars. *Odynerus* and several related genera having very similar habits have the abdomen sessile. They are often gaily colored and some of them place their mud cells within hollow galls or the deserted nests of other insects. *Raphiglossa* forms burrows in the pithy stems of briars and stores its cells with the larvae of weevils. Of the social paper-wasps the species of *Polistes* somewhat resemble *Eumenes* in the slender more or less petiolate abdomen. All of the numerous species build a single tier of cells supported by a central pedicel and unenclosed in a covering. Several of the species are very common and well known. In *Vespa* the abdomen is broad, robust, and sessile, and most of the species, which include the hornets and yellow jackets, are brightly striped with yellow on a black or brown-ground color. The members of this genus exhibit the largest and most highly developed wasp communities. A common large species is *Vespa maculata*, which builds the large oval grayish paper-nests so well known. Externally they consist of several loose covering layers pierced by an aperture at the lower end. The interior is occupied by horizontal tiers of combs, like floors in a house, supported by columns, and with passages between. Each cell is hexagonal, as in the combs of bees, but the material is paper. These tiers of cells are built in succession, the upper ones first. Sexually wasps are of three kinds, males, females, and neuters, the two latter armed with an exceedingly venomous sting. The last are the workers in the hive; they also go out to bring in provisions for the community. Wasps are nearly omnivorous, feeding on honey, jam, fruit, butcher's meat, and any insects which they can overpower. A share of these viands is given to the males and females, whose work lies in the vespiary and in providing for the future progeny of the colony. The cells of a large nest may amount to more than 15,000. In these the females, which are few in number, deposit eggs, hatched in eight days into larvae. These go into the chrysalis state in 12 or 14 days more, and in 10 more are perfect insects. The males do no work. Most of the workers, all the males, and the old females, die at the approach of winter, and in the spring each surviving female, having been impregnated in autumn, looks out for a suitable place to form a new vespiary, and builds a few cells in which are deposited eggs destined to produce workers. The latter then assume the

duties of nest-building, and the number of cells is rapidly increased to provide places for the eggs which the female continues to lay throughout the summer. *V. arvensis* is a smaller species of a richer yellow color and similar habits. The yellow jacket (*V. vulgaris*) builds similar nests in an underground chamber reached by a tunnel, and the large European hornet (*V. crabro*), naturalized in portions of the United States, nests in hollow trees.

The mud-dauber wasps belong to a distinct family (*Sphecidae*). These have the greater part of the abdomen in the form of a bulb borne on a very long and narrow stalk and the head is supported on a distinct neck. The black and yellow species of *Polistes* make the familiar rough mud-cells which are so commonly plastered to the ceilings of barns, outhouses, and garrets, and which are packed with spiders at once paralyzed and preserved by a thrust of the sting through the nerve ganglia. Many of the numerous other genera of this family burrow into banks or along paths, but all have the habit of provisioning the nest with spiders or caterpillars. Some of them are very large and handsome wasps. A related family of burrowing or "sand" wasps is the *Pompilidae*, which have long, non-articulated antennae and rather small eyes. A very fine large species (*Pepisiformosus*), found in the Southern States, is known as the tarantula-killer from its habit of attacking that huge spider, with which its cells are stored. Not infrequently a very large wasp, with a stout, heavy body about 1½ inches long, is seen half flying, half walking, burdened by a cicada which it has captured and is bearing off to its burrow. This is *Sphecius speciosus*, a representative of the family *Bembecidae*, which, like the last two, has the wings unfolded when at rest. Still another interesting family of fossorial wasps is the *Mutillidae*, or wingless wasps. Most of them are richly colored and hairy; and are seen running in sandy pathways. They are commonly mistaken for ants, but sting severely. There are numerous other wasps which cannot be even mentioned. Suffice it to state that the North American fauna includes about 1,500 known species, arranged in 17 families.

Consult: Cresson, 'Hymenoptera of North America' (Philadelphia 1887); Lubbock, 'Ants, Bees, and Wasps' (New York 1876); Ormerod, 'British Social Wasps' (London 1868); Packard, 'Guide to the Study of Insects' (New York 1880); Comstock, 'Manual for the Study of Insects' (Ithaca 1895); Sharp, 'Cambridge Natural History,' Vols. V. and VI. (New York 1895).

Wasson, wă'sŏn, David Atwood, American clergyman and author: b. Brooksville, Me., 14 May 1832; d. West Medford, Mass., 21 Jan. 1887. He entered Bowdoin College in 1849, but remained only one year; went to sea in search of health; studied law and for a short time practised; and in 1848 entered the Bangor Theological Seminary. In 1851 he became minister of a Congregational church at Groveland, Mass., took charge there of an independent society with which he remained until 1857, with an interval of six months at Worcester, Mass. In 1865 he was called to the Twenty-eighth Congregational Society (Theodore Parker's), Boston, but soon retired on account of illness. Afterward he resided for several years

in Germany, and finally settled at West Medford. A profound thinker and writer, of striking originality, and with a style equally powerful and brilliant, Wasson contributed in prose and verse to various periodicals—the 'North American Review,' 'Atlantic Monthly,' 'Christian Examiner,' 'Radical,' etc.—his subjects including political philosophy and government, economics and religion, ethics and social reform. The principal collection of his verse is the volume of 'Poems' (1888), edited by Ednah D. Cheney, including 'All's Well,' a classic of faith; 'Babes of God,' a poem of Wasson's optimistic philosophy; 'Seen and Unseen'; 'Ideals'; 'Orphans'; 'Scipio to the Senate'; and others, equally striking in thought and expression.

Waste, or By-products. Waste is such material as is rendered either wholly or partially useless in the manufacture of products and articles of all kinds, but the name is sometimes retained long after a substance, at one time of little or no value, has been utilized. When iron ore is smelted, or coal distilled, or common salt converted into soda, waste in some form results from the operations. In every manufacturing process, mechanical or chemical, there is waste. The examples given relate to new waste, but nearly everything we use wears, or corrodes, or gets broken or unshapely, and so rags, and rust, and scraps arise. On the other hand, the rust which arises from corroding iron is utter waste, since it can never be profitably collected at all. In respect to the value of "waste," these two, among familiar things, may be taken as at opposite extremes. There is a kind of waste, for the most part difficult to prevent, which goes on in the consumption of fuel, and in certain processes of roasting or calcination in the smelting of metals. Roundly speaking, the best designed steam-engines and boilers require only half as much coal per horse-power per hour as those less skilfully constructed, and the fuel unnecessarily consumed by bad boiler furnaces is largely wasted as smoke through imperfect combustion. The utilization of blast furnace gases for heating purposes, and the recovery of tar and ammonia also produced by the coal consumed in these furnaces, form an instance of a double saving from the same source. In the report of the chief inspector of alkali works for 1891, it is stated that the plant put up in recent years for collecting tar, ammonia, etc., at 57 Scotch blast furnaces cost \$2,223,000, a sum fully equal to the cost of building the furnaces themselves. The condensing flues, miles in length, connected with some lead-smelting furnaces are modern examples for appliances to condense lead fume or smoke which formerly was allowed to escape, causing much loss of lead.

Some instances of how waste in a solid form arises in working rock and other mineral substances may now be given. In shaping and dressing granite paving stones as much as three fourths of the rock quarried is, in some instances at least, wasted. This waste is as yet only very partially utilized for road metal, and in small chips for "granolithic" pavements. The oil shale of the carboniferous formation in Scotland, from which paraffin (q.v.) and paraffin oil are obtained, was itself looked on as of no value till 1869. Blast furnace slag is now utilized in sev-

eral ways, and in a number of cases the accumulations of other kinds of slag on the sites of ancient smelting works have, in modern times, been again put through the furnace to extract the metals left in them, with profitable results. Some of the refuse from the old silver mines of Laurium has been bought up by capitalists for this purpose. One instance, though not of very recent date, may be given where, by the production of a by-product, a fortune was very quickly amassed. About 1840 Mr. Askin of Birmingham discovered a method of separating cobalt, in the form of oxide, from nickel, two metals which were very difficult to separate. This oxide of cobalt was at first a waste product, but before very long it was put into the hands of potters, who readily bought it up to produce a blue color on their ware, at the then rate of two guineas per pound. Among comparatively recent instances of utilization of by-products and waste products in the chemical industries, we may refer to the importance of the substances now extracted from coal tar (q.v.), and the great value of some of them in the manufacture of dyes. Another example is the recovery of binoxide of manganese in the production of chlorine for the manufacture of bleaching powder by Weldon's beautiful process. Formerly for every 100 pounds of bleaching powder made about 100 pounds of the native oxide of manganese were required. Now this manganese is recovered and used again and again in the process, with only a loss of about 5 per cent to make up each time it is returned to the chlorine still. The earlier methods of recovering manganese were not nearly so perfect, and therefore were not much used. A process for the utilization of chemical waste on a great scale is Chance's method, patented in 1868, of recovering sulphur from alkali makers' black-ash refuse.

Passing to vegetable substances, the various materials besides rags used in the manufacture of paper may be first noticed. Straw, wood, and esparto fibre, if not exactly waste products, were at least undeveloped substances before they became, as they now are, so largely used in paper making. Old ropes, flax, and jute mill waste, old or torn pieces of paper of every kind, are all serviceable in paper mills or in the manufacture of millboard. In the pulp of the latter old newspapers bulk largely. Cotton waste is much used by mechanical engineers for cleaning purposes. Sawdust is employed in several ways. Corkcutter's waste has become of high importance in the manufacture of linoleum and cork carpet. From the bark stripped from osier wands the useful medicine salicin is now made. In days not so long past the spent madder of our large dyeworks was suddenly raised from a useless to a valuable material by treatment with sulphuric acid, which converted it into the dye called garancin. Madder itself, which till 1869 held a chief place among our dyestuffs, has since become of trifling importance, through the introduction of alizarin (q.v.). From the seaweed thrown up on British shores iodine is obtained, but, though some is also used as manure, much of it is allowed to decay. One of the most interesting examples of what has been done in converting a waste animal product into a highly useful material is seen in the case of waste silk. Cocoons do not yield half their weight of reeled silk, but the remaining "waste"

WASTE—WASTES

portion has, through the ingenuity of an English inventor, become the raw material for a large spun silk industry. In Venice artificial flowers for ladies' headdresses are made of imperfect cocoons. The various kinds of waste from woolen mills and from the cutting up of woolen fabrics are either worked up again into yarn or felt, or are ground into flock for paper hangings. Glue (q.v.) is made from parings of hide and from bone. The turnings and dust of the ivory and bone turner have various useful applications. Prussiate of potash is made from almost any waste animal matter, such as parings of horns and hoofs, hair, blood, leather cuttings, and even field mice.

Waste, in law, the result of any act or omission by the tenant of any particular estate by which the estate of the remainder-man is rendered of less value. Waste is of two sorts, voluntary and permissive; the former being that caused by active procedure on the part of the tenant, such as the destruction or alteration of buildings, the latter that caused by negligence, such as the allowing of buildings to fall out of repair. On the theory of permissive waste as developed at common law is based the rule which throws upon the tenant the responsibility of making all ordinary repairs in the premises which he occupies. Though he cannot strictly be required to make repairs, and is not liable in damages for any failure so to do, yet in case of an action for waste against him his only defence is a demonstration that he has repaired the waste, and he therefore prefers to maintain the premises in repair.

Wastes, City, Disposal of. The public wastes of a city which must be cared for by one of the municipal departments, commonly the department of street cleaning, consist of street sweepings, dead animals, condemned market material, household refuse—garbage, ashes, and general rubbish; and trade waste—paper, packing material, etc. When these have been collected, it is necessary for the department of street cleaning to make the most economical and least obnoxious final disposition of the various products of its industry. Many, and indeed most, of the materials collected have a definite and considerable value when separate from material of other classes, but a mixture of the various kinds of refuse has no value except the little which can be produced by separating the materials by hand picking.

In any large city the proper treatment of these materials calls for their collection in five separate classes: (1) Street sweepings; (2) dead animals; (3) household garbage and market waste; (4) ashes; (5) household rubbish—cans, bottles, paper, rags, bits of metal—and trade waste. When a city population exceeds say 100,000, the amount of waste is sufficient to warrant this classification, because the resulting economies will counterbalance the attendant trouble and expense of keeping and collecting the materials separately.

(1) Street sweepings consist of about two thirds horse droppings and one third dust and scrap of one kind and another. These sweepings are not satisfactory as a lowland filling because of the large proportion of organic matter; and on the other hand the material has small value for fertilizing purposes because even well kept stable manure has a value of only about \$0

per ton, wholesale, on the basis of the price of manufactured fertilizers; and street sweepings, from their admixture with other dirt, have a fertilizing value of only about \$1.35 per ton. It is evident that such material cannot be shipped far, because its value would soon be equalled by charges for handling and transportation; and the best disposition that can be made of it is to send it out as a farm and garden dressing as far as its fertilizing value will pay the freight. Before the days of high grade fertilizers, such material had a relatively higher value, but nowadays, only in small cities where market gardens and farms are not greatly distant from the centre of population, have street sweepings any commercial value at the point of collection. In 1840 New York city sold its street sweepings and manure for \$38,711; in 1850 the amount received was \$30,898, in 1860 the amount was \$17,928; and all receipts from this source ceased not many years later. In smaller cities, however, while the cost of sweeping the streets will apparently always be a charge on the citizen, the value of the sweepings collected from paved streets ought to pay for their final disposition.

(2) In the matter of dead animals, it is customary to contract with some individual or firm for their prompt collection and removal; and though this is considered a service and is nearly always paid for by the city, yet the value recovered by the contractor from the hides, bones, grease and fertilizer-material goes a long way toward equaling the expense of collection and disposal; and there is good reason to believe that the value of this material when scientifically treated is sufficient to meet the total expense.

(3) The third class, household garbage (q.v.) and market waste, is the division which causes most trouble and expense in any city, large or small. In seaport towns it has usually been cheapest and easiest to tow the mixed wastes to sea and to dump them so far from shore as to be practically unobjectionable. Inland cities and towns, however, have found great difficulty in disposing of organic waste, because the method of disposition adopted must be satisfactory at once to the community and to its neighbors. These municipalities have usually endeavored to sell their edible waste, even if not very fresh, for use as food in large piggeries. Many, too, even within recent years, have used it as food for milch cows. But consumers of the pork and consumers of the milk have gradually risen in protest, and guardians of the public health have urged many reasons why the practice should be abolished. The revenue derived from it and the difficulty of finding a better method have been serious obstacles to change; but the practice has generally given way to the compost heap, which in turn has usually died an early death from the vigorous objections of its neighbors.

When mechanical methods were sought, the first impulse naturally was to *destroy* an article which had been the source of so much danger and trouble; the second impulse was to *save* a substance which was known to be valuable. The development of these two ideas has led to the invention of incinerating and utilization methods, respectively. The term garbage is used here to signify only table, kitchen and market refuse, consisting of animal and vegetable scrap, always wet and putrescible. The composition of this material varies with the season and with

WASTES

the city, but the average in America is approximately: Water, 70 per cent; grease, 3 per cent; solid fibre, 27 per cent. Such material cannot be burned until its 70 per cent of closely-held water has been freed and evaporated; and, on the other hand, its grease and fibre have commercial value if they can be separated from the water and from each other.

Every housekeeper knows that small amounts of garbage can be quickly disposed of by a good fire; but when the endeavor is made to destroy a large amount of garbage by a poor fire, the trouble begins. In all cases noxious fumes are produced, and escape unless the temperature is high—2,000° F. or more, and freedom from offensive odors is gained only at the expense of fuel. The organic fumes must be decomposed and destroyed within the furnace itself, and therefore the process must be one of complete combustion and not mere evaporation or distillation. When a small amount of garbage is mixed with a large amount of paper, excelsior, shop sweepings, and waste coal and clinker, the incineration process is neither difficult nor costly; and is permissible in the outskirts of a town or city where there are no neighbors within a mile to be troubled by the fumes which in practice always escape with the chimney smoke and come to the ground at a greater or lesser distance according to the force of the wind. Many city incinerators for this kind of waste destruction are in use in the United States and Canada; many of practically the same class have been in use in England for a long time, and from there the practice has extended to Hamburg and some other places; but none of these incinerators endeavor to burn pure garbage, but always the mixture above mentioned. As a matter of fact, there is enough heating power in a pound of dry garbage to evaporate the water from the next pound, and therefore there is no reason why a furnace cannot be so constructed that each pound of garbage may dry the next succeeding pound, and garbage thus be made to burn itself, with only enough added fuel to insure the destruction of fumes.

Garbage utilization processes all aim to extract the grease by cooking in steam or in naphtha, after which the solid material or fibre is dried and ground to form a fertilizer base. The recoverable grease amounts to about 60 pounds per ton of raw garbage, and is salable at about 3 cents per pound. The dry fibre averages 540 pounds per ton of winter garbage, and derives its value from the presence of ammonia—18 pounds @ 8c.=\$1.44; phosphoric acid—18 pounds @ 1c.=18c.; potash—6 pounds @ 3½c.=21c., or a total recoverable value of \$3.63 from a ton of raw winter garbage. Summer garbage is less valuable because it contains more water and less grease and fibre. The cost of treatment, when the quantity is large, is less than the value of the material recovered. In American cities the amount of garbage collected averages about a half pound per citizen per day; in Europe it averages less than a quarter pound. Many people object to keeping separate garbage cans because of the odors which arise unless the water is absorbed by a mixture of ashes, paper and other waste; but in a large city where garbage is collected daily, it is evident that material which has come from the table within 24 hours must be odorless and unobjectionable, and that the odors arise solely from the cans, and from

them only because they are not regularly washed and kept clean.

(4) Ashes are always available for lowland filling, and steam ashes are particularly sought by builders for use in fireproof floors, as a foundation for the cement floors of cellars, and as a substratum for sidewalks and flagging. The ash output amounts in the northern parts of America to nearly three quarters of a cubic yard per citizen per year, and many efforts have been made to utilize its various constituents so as to save the cost of carting or boating it away for filling purposes. Ordinary household ash from anthracite coal consists of: Fine ash, 50 per cent; coarse ash, stone and clinker, 30 per cent; coal, 20 per cent. Such recovered coal has a ready cash sale, and while the daily value of the ash from a single building is probably too small to pay for its separation, yet the process may be profitable when conducted on a large scale, in proper buildings, and aided by mechanical means of separation. This recovered coal has an average heating value of about 75 per cent of that of new coal and has many advantages as household fuel because of its ease of ignition, and its freedom from dust, clinker and slate. In the borough of Manhattan, New York, the annual output of ash is not far from 1,500,000 cubic yards, or 1,200,000 tons, and the amount of recoverable coal contained therein is not far from 250,000 tons. If the ash collections are kept free from street sweepings and garbage, the recovery may be made by a machine capable of separating coal from clinker; and the value of the recovered coal will be nearly sufficient to meet the expense of ash collection and disposal.

(5) The class of waste including general rubbish—cans, bottles, old rubber, paper, rags, bits of metal, etc.—is a perennial delight to scavengers, who withstand dust and smells in order to pick out these things from a mixed mass of animal and vegetable refuse. But since city authorities have learned to keep the different classes of waste separate, this rubbish has become a source of revenue to the city even after paying the cost of collection and sorting. Old cans are sold at \$3 per ton for their solder and value as material for cheap castings. Bottles are of two classes, "registered" goods—bottles which have the proprietor's name blown in the glass—and plain bottles without names. The average price, at the place of collection, for "registered" bottles, which by law may be sold only to their original owners, is one cent each. Plain bottles are put into barrels and sold to dealers at \$1.50 per barrel. Broken glass, too, has a market value of 10 cents per bag. Rubber scrap is worth 5 cents per pound at the rubber-reclaiming factories. Waste paper, when clean, is worth from \$4 per ton for newspapers to \$40 per ton for fine white paper, the average price for the paper collections of a city being about \$9 per ton. Rags vary in price, as do papers, many of the rags being used for paper stock. These materials have such value that only a small proportion reaches the carts of the department of street cleaning. The large proportion is collected by house to house visitation by junk-cart men, of whom there are in the borough of Manhattan, for instance, some 400, whose purchases amount to about \$1,000 per day; and only the balance is collected by the department carts. An idea of the extent of the trade in these waste materials may be gained from the statement that

WATAUGA ASSOCIATION—WATCHMAKING

the yearly collection of old rubbers in the United States amounts to about 17,000 tons, of which some 600 tons per year, worth \$50,000, are collected in the borough of Manhattan. Some of the other yearly collections in Manhattan are as follows: "Registered" bottles—principally syphon bottles and those used for carbonated waters, soda and beer—2,000,000, worth \$20,000; plain bottles, 30,000 barrels, worth \$45,000; waste paper, \$2,000,000 worth; rags, \$75,000 worth; bits of carpet, string, iron, brass, etc., to the amount of several thousand dollars more. Though, as said above, only a small proportion of these things goes to the waste heap, yet, since the department has provided separate carts for dry rubbish, the city has received annually nearly \$100,000 for the delivery of these collections to contractors at the docks. The various materials are delivered mixed from each cart, and some \$150,000 is paid annually by the contractors to laborers who sort the waste into separate piles, after which it is sold to various dealers. Allowing a reasonable profit to the contractors, it is probable that the amount received by them is not less than \$300,000. Therefore these bits of scrap thrown away by the housekeeper have become worth \$100,000 by their collection at the receiving station, and have become worth \$300,000 by separation into their component parts.

The problem of the general separation of waste materials is simple in the household but difficult in the community. It is all a matter of education in ethics and community economy, and requires strict rules with sure penalties for infraction. If each member of the population would increase the salable value of his household wastes one half cent per day by keeping these wastes separate, the total amount would be sufficient to defray all the expenses of the department of street cleaning in any city in the United States. See STREET CLEANING.

C. HIESCHEL KOYL,
Consulting Engineer.

Watauga Association. In American history a name adopted by a party of settlers who established the first independent civil government in North America. In 1768, the Six Nations (q.v.) agreed to surrender all the lands between the Ohio and Tennessee Rivers. The first settlers were largely from Virginia and the first settlement was made on the banks of the Watauga River in 1769. The Watauga Association, established in 1772 by John Sevier, James Robertson and others, subsequently grew to be the State of Tennessee. Under the title "Articles of the Watauga Association," a written constitution was drafted, the first ever adopted by a community of American-born freemen. See SEVIER, JOHN.

Watchmaking, Modern. It is an accepted fact of horological history that the portable mechanism from which has been evolved the modern pocket watch had its origin in Germany. And until the last half of the 19th century the watchmaking industry was confined to a few European countries, particularly to Switzerland and England.

The methods employed by all European watchmakers involve a great degree of individual skill on the part of the various workmen, a skill which can be acquired only by years of application and experience. But as it

is the custom in the watchmaking districts of Europe for the children of a family to adopt the line of work pursued by the parents, the acquisition of superior manual dexterity would tend to be both natural and easy. Such skill would, however, lie within narrow limits. For instance, the members of a certain family would for succeeding generations be engaged in the making of a given piece or portion of the watch, one family making wheels, another regulators, another dials, etc. The several parts produced by these various families being brought together by still others, who fitted them to each other and sold them in the form of completed watches. Practically the same methods were in use in the watchmaking districts of England. But while watchmaking in England has to a great extent declined, the Swiss are still largely engaged in the business, but their methods have been materially modified through the introduction of American machines.

It may be properly said that Europeans made watches by long used methods, while Americans made a radical departure from established ways and originated a system, the foundation of which may be briefly stated as the substitution of impersonal machines for the acquired skill of the individual workman. A half century of continued growth has given practical demonstration of the correctness of the theory on which this system was founded. It is conceded to have had its theoretical origin in the mind of Aaron L. Dennison, a young Boston watchmaker, who in 1849, after months of planning and endeavor, succeeded in enlisting the co-operation of Edward Howard and his partner, makers of accurate instruments of various forms. Having secured capital to the amount of \$20,000, they built a small factory in Roxbury, where about four years was spent in preliminary work and in the production of a few hundred watches. In 1854 a new factory was built in Waltham, Mass., about ten miles from Boston. This factory, after numerous changes and additions, now exists as the oldest watch factory in America and the largest in the world. Here really began the manufacture of watches on what is now known as the American system, so that it may fairly be said that modern watchmaking belongs peculiarly, if not exclusively, to America. We have said that the American system of watch manufacture employed machines as a substitute for the acquired skill of the individual workman. But the foundation of the system is that of practical uniformity in the measurements of large numbers of any given parts of watch movements, so as to permit of interchangeability.

Manufacturing on the basis of interchangeability may be said to have been in its infancy at the middle of the last century. Doubtless that system had its finest exponent at the time in the United States armory at Springfield, Mass., where were manufactured muskets for the use of the army. Mr. Dennison believed that, notwithstanding the diminutive character of watch parts, as compared with muskets, it would be possible, by the employment of suitable machines, to manufacture large numbers of such parts of such exact uniformity as to be readily interchangeable. The original American watch factory was therefore planned on that theory. But to fully equip a watch factory with tools and machines capable of producing work

WATCHMAKING

in that systematic way, would involve the employment of very large capital. The original factory was not fortunate enough to command sufficient confidence of capitalists to enable it to do more than make a beginning, but accomplished enough to demonstrate the practicability of the system. Its development has, however, been continuous, until at the present time machine watchmaking has to a limited extent been adopted in Switzerland, while the old methods of manufacture in England have declined to such an extent that there now remains but a small per cent of the former business.

A watch is really quite a simple machine, containing an average of about 150 distinct parts. By actual count it has been found that the production of all these parts requires over 3,700 distinct operations. It will, therefore, be readily understood that the manufacture of watches on an extensive scale is one of the most complex and exacting manufacturing problems ever undertaken. It calls for high grade talent in almost every direction, and involves an intricacy of detail which can be mastered only by years of study and experience.

This being the fact, it will be hopeless to attempt more than a brief and fragmentary description of a few of the manufacturing processes involved; and it should be understood that the methods employed, and the means used, are not identical in all American watch factories, but doubtless they are as diverse as the factories themselves. It will therefore be best to indicate the most advanced methods only, which in the nature of the case can be found only in a large factory, possessing the absolute requisite of plenty of capital; for high grade automatic machinery is of necessity quite expensive, while at the same time its productive capacity exceeds the requirements of a small factory.

Beginning then with the foundation of the watch movement—the "pillar plate"—it should be said that these larger parts (which in the cheaper grades of watches are of brass, and in the better grades are of nickel alloy) are made at brass mills, from dies furnished by the watch factories, and are received in the form of blank "punchings." After these blanks have been carefully cleaned they are placed in a tubular magazine located at one extreme of a "facing machine" directly beneath a "carrier," which is attached to the extremity of a swinging arm. When the machine is put in motion the carrier descends and grasps one of the plate blanks and lifts it clear of the magazine and swings around to a point directly in front of a suitable chuck or holder on the running spindle of the machine, which at that instant is not in motion. The carrier then descends until the blank is in exact line with the axial centre of the spindle. When in this position the chuck is opened to receive the blank, which is pushed into the waiting chuck, which immediately closes tightly upon it. The carrier then rises and swings to a position midway of its excursions. The spindle then begins to revolve at a suitable speed, and at the same time moves forward so as to bring the revolving blank into the path of a suitable cutting tool which at once commences to move toward the axial centre, cutting away a definite portion of

the blank, and leaving it with a perfectly flat and smooth surface. As soon as the cutting tool reaches the centre of the blank, it is withdrawn from contact and returns to its former position. At the same time a second carrier swings around from the opposite side and places itself directly in front of the chuck containing the faced blank; the grasp of the chuck is relaxed and the blank is pushed out of it and into the second carrier which at once swings around and deposits it in the chuck of a second running spindle—a duplicate of the first. In this second position the other side of the blank is faced; then a third carrier takes the now double-faced blank and deposits it in a receptacle at one end of the machine.

As the movements of the three carriers are simultaneous, and the cutting tools move in unison also, it will be seen that notwithstanding the numerous operations which succeed each other, a completed blank is deposited at one end of the machine at practically the same instant that another one is taken at the other. Slight modifications in parts of the machine provide for desired recesses on either one or both sides of the blanks. These machines do their work on plates at the rate of 1,800 per day, so that it will be seen that they are far too productive for any watch factory which is not organized for a large output.

Succeeding the facing operations, just described, comes that of drilling most of the numerous holes in the plate needful to receive the screws, pins, etc., for attaching the "top plate," balance cock, pallet bridge, etc. The ordinary method of drilling has been to clamp the blank watch plate to a master plate or "drill jig," in which were the required holes of proper size and accurately located, which holes served as guides to the various drills required. But inasmuch as the number and location of holes in such a jig were necessarily quite limited there was involved the use of several jigs to complete the drilling on each and every watch plate. Of course also an operative was required to insert and remove the plates and to manipulate the drills. Following the operations of drilling there is required the "threading" or tapping of certain holes for the reception of screws. This operation involved the repeated handling of the plates.

D. H. Church, the mechanical superintendent of the American Waltham Watch Factory, in addition to other machines in great variety, has invented an automatic plate-drilling machine capable of both drilling and tapping practically all of the holes in the watch plate, in which the only work of the attendant is to fill with blank plates the magazine at one end of the machine and remove them from a similar magazine at the other end, where they are automatically deposited, completely drilled and tapped. In some instances the operations performed on each plate number 135, and the plates are delivered at the rate of one in 90 seconds.

Following the drilling of the plates comes the turning of the required recesses in both sides to make room for some of the moving parts of the watch, such as the main-spring barrel and some of the wheels of the "train."

The automatic recessing machines are also provided with delivering and receiving maga-

WATCH MAKING MACHINERY.

WATCHMAKING

zines located at the extreme ends of the machines, and between them are a number of parallel heads each provided with a running spindle and "chuck," and in suitable relation to each a compound slide rest carrying a special cutting tool adapted to the work to be done. Carrying arms automatically take the plates from the magazine and the successive chucks and transfer them to the next in order. But this transfer must be done with the utmost exactness, for the plates must be so held in the various chucks that the axis of revolution shall in each successive operation be in a new but definite part of the plate. Moreover, the plates are located and kept with utmost precision in their proper position by guide pins in each of the clamping chucks, which pins correspond in relative position with certain of the drilled holes in the plates. It is needful therefore that, as the plate is presented to each succeeding chuck, its guide pins shall be exactly in the proper position to enter the hole in the plate. The attempt to attain the required exactness of movement was regarded at first as a bold one, but complete success justified the hopes and expectations of the inventor.

The other supporting plates of the watch are treated in the same manner as the pillar plates above described, their differing forms of course demanding correspondingly differing chucks and holders.

For numerous succeeding operations of boring, turning, milling, etc., special machines are provided, many of them being exceedingly interesting in their intricate movements, but impossible of any brief description.

The American system includes the production of every portion of the watch in one establishment, but in very few even of the American watch factories has this ideal been attained. The fact that certain components of the watch, such as dials, hands, mainsprings, etc., which do not demand extreme exactness in fitting, can be imported from Europe, or produced in special factories, has enabled a number of incomplete factories to turn out watch movements, in considerable numbers, without the investment of large capital. But the original American watch factory is equipped for the production of every part of the watch movement, down to the delicate little taper pins used to confine the ends of the hairsprings. By means of special machines these little pins are made at a rate exceeding one in two seconds. Even the fragile enamel for coating the dials is manufactured from the raw materials; as also the pure gold ornaments used to embellish "fancy dials." These things, however, do not demand the extreme accuracy which makes watch manufacturing so extremely trying.

It may be proper at this point to speak of one feature of watch manufacturing which might seem to show incompleteness in the "system." For many years the original American watch company manufactured watch cases as well as movements. But as their watches grew in favor, new watch companies were created, and as those new companies did not attempt the making of complete watches, other factories were organized for the exclusive manufacture of watch cases. As movement making has increased, case factories have also been multiplied

to an extent hardly warranted by the production of movements. All case factories, however, of necessity conform to the standards of measurement furnished by the movement makers, and those standards are so practically uniform that regular cases of all makers will fit corresponding movements produced by any of the regular watch companies.

This systematic method of manufacturing to standard dimensions is of exceeding importance to watch dealers, and the purchasing public also, as the customer is thereby enabled to select a watch movement of any desired size or grade, and also to select from a variety of cases one of such style or weight as best suits his taste. The ability to make independent selections of movement and case is one of the advantages of modern watchmaking made possible by the American system.

The use of automatic machines was applied to the manufacture of the smaller portions of the watch much earlier than to the production of the plates, as above described, indeed, it may be said that some of the earliest machines employed were semi-automatic. But so radical have been the changes and improvements instituted within the last 15, and especially during the last eight years, that methods previously used can hardly be considered as modern watchmaking.

One of the most interesting of those which are strictly modern is one for the turning of the delicate arbor on which is mounted the most swiftly moving wheel of the entire watch, the "balance." The fact that this wheel moves with such rapidity, together with the fact of its location at the farthest point from the reservoir of power, in the mainspring, makes it absolutely essential that it should be subject to the least possible amount of running friction. Consequently the pivots of this "balance staff" are exceedingly minute. It is of course an absolute necessity that every portion of the staff, including the delicate pivots, should run absolutely true. Exact truth was a difficult attainment under the methods ordinarily used, although great care was used to avoid any stress or distortion of the staff, by a very gradual reduction of the blank, so that 10 to 14 separate turnings were required to complete a staff. By the most approved modern methods and machines, all of the required turnings, including the pivots, are performed before the completed staff is severed from the rod of wire from which it is made. So complete is the machine, and so accurate and rapid is its operation, that a staff is delivered from the machine each 90 seconds.

The pinions of various sizes, which compose so large a portion of the time train of the watch, are formed from the best quality of steel rods, and, as this wire must of course have a diameter as great as the largest part of the pinion, it follows that a large proportion of the material must be removed to bring the pinion to its finish dimensions. An early method consisted in first cutting the wire into blanks of sufficient length, then to insert those blanks in a suitable chuck in the running spindle of a lathe, and with a suitable tool to remove the metal from the projecting end so as to bring it to an accurate point or centre. The blank was then reversed in the chuck and the opposite end pointed in like manner. In some instances a

WATCHMAKING

portion of the excess metal was removed in connection with the operation of pointing.

Following this somewhat crude method of pointing and initial turning, came the invention and adoption of so-called "roughing out machines," in which a rod of wire is inserted in the machine which automatically cuts off, points and turns the blanks on both ends and delivers them uniform in dimensions and requiring only the slight finish turnings and the cutting of the teeth when they will be ready for hardening and tempering.

A later form of machine has been devised, which takes a rod of wire at one end and delivers the pieces "finish turned" at the other end.

The finished blanks are then placed in a magazine or "feeder" in a cutting machine which automatically takes them one at a time and forms the teeth of the required number and shape, the work of the attendant being to keep the magazine supplied with blanks, and to examine the pinions occasionally in order to detect any imperfections, so that a single person can easily attend six cutting machines. For the greater convenience and comfort of the operator a chair is fitted to run on rollers on an iron track on the floor. These rolling chairs are also provided in connection with numerous other machines where a single person attends to a number of machines.

Within two or three years D. H. Church of the Waltham factory has created machines in which pinions are completely turned and the required teeth are cut. All the work being automatically performed, so that completed pinions are made, the last operation being to sever the finished pinion from the rod of wire from which it was formed. The exactness with which these machines operate makes possible the production of pinions which could not have been produced with tools and machines in previous use.

The limits of this article preclude more than the brief mention of a few of the features which are peculiar to modern watchmaking. Only one additional class of machines will therefore be mentioned. As each watch movement requires from 30 to 35 screws it will be evident that for a daily product of more than 2,500 watches more than 100,000 screws would be required. By the earlier methods employed in American watch factories an active man could make from 800 to 1,200 screws per day so that more than 80 men would be required for the production of this large number. But within a few years screw-making machines have been devised which are capable of making from 4,000 to 10,000 screws each per day, and being entirely automatic in action, a single attendant is able to attend six or more machines.

The almost absolute uniformity in the operation of the most improved modern watch-making machinery insures a resulting product so uniform in quality and dimensions as to make needless the minute "fitting" operations which are indispensable in work produced by even the earlier American methods. So accurately is the work performed that many of the most delicate portions of the watch, whose exact performance is absolutely essential, do not come together until all the finished parts meet for the final assembling.

It may appear strange, but it is nevertheless a fact that, by modern methods, watches

are not made by watchmakers, as that term is generally understood, but by machines. But when the numerous portions of the mechanism are made and assembled, the work of the skillful watchmaker begins; for he it is who by means of the skill and judgment, which come from experience, is able to discover the individualities and peccadilloes of each movement, and so remove any crankiness that its performance shall be satisfactory. In the better grades of movements there may also be required certain manipulations to "adjust" the watch so that errors of position and temperature may be compensated for.

It has already been said that the manufacture of watches by modern, that is, by American methods, is a very complex business, involving the employment of large capital and demanding the highest executive and mechanical talent.

For lack of some or all of these prime requisites a large number of watch factories in America have met with fatal disasters. But notwithstanding the multitude of such failures, and the further fact that not until after years of struggle and financial loss did any of the now existing watch factories receive any profitable returns whatever, there yet seems to be a peculiar fascination in the idea of watchmaking, so that new factories are still being organized. The wonderful business prosperity of the past few years in the United States has created a demand for watches which the more advanced factories could not possibly meet, and has given an opportunity for the smaller and poorer equipped factories to profitably market their relatively small product. It is gratifying to the pioneers of the American system to find that the superiority of machine-made watches is being recognized throughout the world.

The enormous growth of the railroad business in the United States and the greatly increased speed at which trains are now run has made absolutely necessary a standard of time and a high degree of accuracy in the running of all time pieces which are in any way connected with the running of trains. These new and exacting requirements are met by a few high grade watches with special adjustments to position as well as temperature. The natural effect of the requirements of the railroad time service has been to establish a higher standard of accuracy in rate for watches for the general public, and as there can be no arbitrary standard for comparison, or for reference, the ultimate and the absolute standard is found in the movement of the stars.

Very properly the United States government, by means of its astronomical equipment, at its naval observatory in Washington, is able to conduct the required stellar observations, and through the agency of the Western Union Telegraph Company distribute accurate time signals throughout the entire country. Previous to the establishment of this government system of time service, the American Waltham Watch Company had established an observatory with a complete equipment of instruments for observing and recording the stellar movements by which to compare its watches. This equipment consists of a fine transit instrument and recording chronograph made to order by the famous firm of Alvin Clark & Sons, together with two fine mean time clocks having gravity

WATCHUNG MOUNTAINS—WATER

escapements, made in the American Waltham Watch Company's factory, and in addition to these, another clock regulated to sidereal time. From one of the mean time clocks time signals are constantly transmitted to all parts of the factory. This feature of providing accurate timing standards is peculiar to modern watch manufacturing, and so far as is known no watch factory in the Old World is equipped in this manner. But, on the other hand, the Royal Observatory at Kew, England, and the Government Observatory at Neuchâtel, Switzerland, undertake the testing of the limited numbers of watches submitted by the manufacturers of those two countries.

In conclusion, it may be said that notwithstanding the two or more centuries of priority and experience enjoyed by European watch-makers, their extreme conservatism has allowed them to be outstripped by the more progressive manufacturers of America, so that modern watchmaking is at the present time, and in its most advanced form, an exclusively American achievement.

E. A. MARSH,
General Superintendent American Waltham Watch Company.

Watchung, or Orange, Mountains, in New Jersey; a range of hills west of Paterson, Plainfield, and Orange, extending north and south, but curving westward at each end. Length, about 40 miles. There are three divisions of the range, each composed of trap-rock, which was a lava flow about the time other portions of New Jersey were in a more advanced stage of formation. The mud and sand covering followed, and now the ranges are mostly shale and sandstone. The trap-rock, in places, forms elevations from 300 to 400 feet high, the soft sedimentary beds once enclosing it, yielded more rapidly to erosion. There is a similarity in the material composition of the Watchung Mountains and the Palisades, the difference being more in the direction of the original lava flow. The Palisades sheet was not a surface flow, but was forced between the sedimentary beds.

Water, a universally diffused liquid, the true nature of which was not discovered till toward the close of the 18th century. In 1781 Cavendish carried out a series of experiments by detonating mixtures of common air and hydrogen, or dephlogisticated air, as it was termed. He showed that by regulating the relative quantities "almost the whole of the inflammable and dephlogisticated air is converted into pure water." Although Cavendish showed experimentally that water is produced by bringing together oxygen and hydrogen, yet to Lavoisier, who received information regarding Cavendish's experiments, must be assigned the merit of interpreting aright the experimental results, and of proving that water was a compound substance—a compound of hydrogen and of oxygen.

Water may be produced by exploding a mixture of two volumes of hydrogen with one volume of oxygen; by passing hydrogen over many heated metallic oxides; and in various other ways. It exists, although never in a perfectly pure state, in immense quantities in nature. The composition of water has been determined by two distinct methods: (1) by volumetric synthesis; (2) by gravimetric synthesis. In volumetric synthesis of water measured volumes

of pure dry hydrogen and of pure dry oxygen are mixed, and the mixture is exploded by the electric spark while standing over mercury; the residual volume of gas is then measured; it is found that two volumes of hydrogen invariably unite with one volume of oxygen. In the second method a weighed quantity of a metallic oxide (usually cupric oxide) is decomposed by means of pure dry hydrogen at a high temperature, and the water which is produced is weighed. The decrease in weight of the oxide gives the quantity of oxygen in the water formed, while the difference between the total weight of water and the weight of the oxygen gives the weight of hydrogen used. It is found that 16 parts by weight of oxygen are always united with two parts by weight of hydrogen to form 18 parts by weight of water. As 16 is taken to be the atomic weight of oxygen the formula of water is H_2O .

Water is a colorless, tasteless, inodorous liquid. At all temperatures below $0^{\circ}C$, it is a solid, and at all temperatures above $100^{\circ}C$, it is a gas. When water at 0° is heated it contracts until it reaches the temperature of $4^{\circ}C$, after which it expands; conversely, when water at 100° is cooled it contracts until it reaches the temperature of $4^{\circ}C$, after which it expands; $4^{\circ}C$ ($=39.2^{\circ}F$) is called the point of maximum density of water; the specific gravity of water is greater at this than at any other temperature. The fact that water expands on cooling from 4° to 0° is a most important one. If a sheet of fresh water be cooled, the upper layers become more and more dense; they therefore tend to sink, and so fresh surfaces are exposed to the cooling influences. But when the temperature of the mass of water has reached 4° and further cooling of the surface causes an expansion of the upper layers, which continues until these become ice; these layers of cold water consequently float upon the warmer water underneath; hence it is impossible for the mass of water to suddenly freeze throughout. When water passes from the liquid to the solid state it expands to the amount of about 1-11th of its volume. This expansion is sufficient to bring about a large quantity of mechanical work; and to it the bursting of water-pipes during frost is to be largely traced. When solid water becomes liquid, or when liquid water becomes gaseous, a considerable quantity of heat is rendered "latent." Steam issuing from boiling water is no hotter than the water itself; water formed when ice is melting is no hotter than the ice itself; yet heat is being communicated to the ice and to the water. The latent heat of water is 79 thermal units; the latent heat of steam is 536 thermal units. In other words, in order to convert unit weight of ice at 0° into water at 0° a quantity of heat must be communicated to the ice, which, if communicated to unit weight of water at 0° , would raise its temperature to $79^{\circ}C$. In order to convert unit weight of water at 100° into steam at 100° such a quantity of heat must be communicated to the water as would suffice to raise the temperature of that weight of water through $536^{\circ}C$, or 536 times that weight of water through $1^{\circ}C$. Before water can become steam the upward pressure of its vapor must overcome the downward pressure of the atmosphere; hence it follows that the boiling point of water is conditioned by the atmospheric pressure. Water boils at a much lower tem-

WATER

perature on mountain tops, where the pressure is comparatively small, than in the valleys.

The solvent power of water is very large. As a rule hot water dissolves larger quantities of solid matter than cold. As has been mentioned water is never found in nature in a state of purity. The different kinds of natural waters may be divided into three groups: (1) Rain water; (2) river water; (3) spring, including mineral water and sea water.

Rain water, when collected before it touches the earth, contains only such impurities as may be derived from the atmosphere, chiefly consisting of oxygen, nitrogen, and carbon dioxide. The rain water of towns contains comparatively large quantities of acids and of soluble salts. The amount of these substances may be taken as an estimate of the comparative purities of the atmospheres of different towns. Rain water collected near the sea is rich in chlorides.

River water varies greatly in so far as the nature and quantity of the substances held in solution by it are concerned. The soluble constituents of river water are chiefly such as may be derived from the rocks through which the water of the springs which have fed the river has percolated. The dilution of the original spring water by the continual influx of tributaries reduces the relative quantity of solid matter held in solution, while the escape of carbon dioxide during the exposure of the surface water to the air causes the precipitation of those salts which were held in solution by the aid of the carbonic acid. River water is often largely contaminated by the drainage of towns or of manufacturing factories situated on the river banks.

Spring Waters.—The soluble constituents of spring waters are very various. In some springs the quantity of dissolved solid matter is but trifling, while in others it amounts to 2,000 grains per gallon. Spring waters are usually divided into classes in accordance as one or other dissolved constituent predominates. See **MIXED WATER**.

Sea water is essentially an alkaline chlorinated water. The quantity of solid matter held in solution varies in the waters of different seas. Inland seas, as a rule, contain less solid matter than the ocean; thus the solid content of the water of the Black Sea amounts to about 1,760 parts per million, while that of the Baltic averages 17,700, and that of the Atlantic Ocean 36,000 parts per million. The constituents of sea water are chiefly chlorides and sulphates of sodium, magnesium, and potassium, together with bromides and carbonates, chiefly of potassium and calcium.

Use of Water.—In considering the suitability of a water for domestic use attention should be principally paid to (1) the source of the supply, (2) the total solid matter held in solution by the water, (3) the organic matter held in solution, and (4) the action which is likely to be exercised on the water by the means of supply. Let us consider these points briefly. In examining the source of a water supply attention should be especially paid to the proximity of drains or sewers of any description, and to the likelihood of contamination from these sources. The nature of the soil through which the water percolates should also be inquired into. The solid substances held in solution by a sample of water may be estimated by evaporating a measured quantity of the water to dryness in a platinum

basin heated by steam, and weighing the residue. From a knowledge of the total solids in a water, unaccompanied by any further information, no reliable conclusion as to the suitability of such a water for potable purposes can be deduced. In seeking to determine whether a sample of water has undergone contamination with hurtful organic matter the following points are to be more particularly attended to: (1) Estimation of the amount of chlorine, whether existing as hydrochloric acid or as a chloride; (2) estimation of ammonia; (3) estimation of nitrates, and (4) detection, and estimation, if necessary, of poisonous metals. The presence of an undue amount of chlorine generally points to contamination with animal matter. Pure waters do not as a rule contain more than three to four grains of chlorine per gallon. It must, however, be borne in mind that such waters as flow through a soil rich in chlorides—such, for instance, as the waters found in the neighborhood of the Cheshire salt-beds—always contain large quantities of chlorine. The sudden appearance of chlorides in a water previously free or nearly free from these substances points to animal contamination.

Ammonia may be obtained from most waters by distillation after the addition of a little sodium carbonate; when the whole of this ammonia has been driven off it not unfrequently happens that the addition of an alkaline solution of permanganate of potassium and heating results in the production of a further quantity of ammonia. The ammonia obtained by the first distillation is usually spoken of as "free ammonia," while that obtained by the second distillation the name of "albumenoid ammonia" is given. The presence of even small quantities of albumenoid ammonia points unmistakably to organic contamination. Such ammonia is derived from the decomposition, by the agency of the alkaline permanganate liquid, of nitrogenous matter of animal or vegetable origin. Pure water should not contain more than 0.50 parts of "free" ammonia per million, nor more than 0.08 parts of "albumenoid" per million.

If nitrogenous matter has become thoroughly oxidized it gives rise to the formation of nitric and nitrous acids. The presence of these acids or of their salts, therefore, generally points to previous contamination of some organic nature. As, however, these things are the harmless—that is, in the quantities in which they occur in waters—products of the decomposition, and therefore of the removal, of hurtful substances, their presence, even when in comparatively large quantities, ought not of itself to condemn a water. The poisonous metals which are most likely to occur in drinking waters are lead and copper. These may be easily detected and estimated even when present in exceedingly minute quantities. For details of the analytical methods of water analysis reference must be made to manuals of applied chemistry. It is evident that in a water analysis we look for symptoms of a disease; not for substances which are in themselves hurtful, but for substances whose presence is associated more or less invariably with others, the action of which upon the system cannot but be most pernicious.

In storing water for domestic purposes the water may undergo contamination from the vessels containing it or from proximity to drains or other places emitting noxious gases. It is

WATER

certain that water exercises a solvent action upon lead; but our ordinary leaden water cisterns become coated with a comparatively insoluble compound of lead, so that the danger of contamination from this source is not great. Hot water should never be stored in leaden cisterns; it very quickly corrodes and dissolves the metal. Aerated waters act rapidly on lead; for this reason they should never be prepared in leaden vessels. The solvent action of water on copper is very small. The system of storing water for drinking or cooking in cisterns close to, or even communicating with, the house drainage system, is a very bad one. (See *SANITARY SCIENCE AND PUBLIC HEALTH*.) In some circumstances, as in the case of swimming-baths, large quantities of water have to be heated to a certain temperature and kept at the same for a considerable time while the water has to be maintained in a due condition of purity.

Water, Its Relation to Disease. Water is a necessary element for the maintenance of the life of both plants and animals. It is technically a food and is as necessary as food. It serves as a diluent and as a solvent and as a necessary ingredient of the plasma of the cells, maintaining the cell turgor and influencing partly by its chemical, partly by its physical properties, the osmotic tensions in the cells necessary to their healthful functioning. For most individuals two to three pints of water a day are necessary; many need more, most people are healthier if they drink at least two quarts of water a day, in addition to the water of their food. Each and every individual in a community, however, makes use of a much larger amount of water than this. The domestic uses of water are numerous. Cooking, washing, bathing, etc., consume much. The care of streets, of stables, of animals, etc., requires it; in short, the amount needed per person in the population, instead of the two to three pints mentioned, for all purposes amounts, according to Parkes' original calculation, to at least 12 gallons per day. His is a very small allowance, judged by modern American standards. Twenty to 40 gallons per day per person is a better allowance, even 50 is not too much. Excess amounts are often wasted to the detriment of the health of the people. Towns and cities need a greater water supply per person than do villages and small communities. It is an interesting comment that in small towns in which a public water supply has been established, the amount of water at first used is within the economic limits; but in a few years, if the supply is unlimited, the inhabitants soon learn to waste more than they originally used. In large cities like New York, Chicago, or Philadelphia, it has been estimated that the supply is really extravagant, three to five times the maximum requirements, and yet the politicians are constantly building new reservoirs. For many domestic purposes it is necessary to use pure water. Sea water may be used for street cleansing purposes, for fire engines, and many manufacturing purposes. Whereas for special reasons a dual system of water supply may be necessary it has been found better and cheaper to have one good supply and watch it carefully for its purity. Pure water, is really almost an impossibility. Pure and impure are only relative terms. A pure water does not exist in nature—gaseous or solid ingredients are al-

ways in solution in even rain water. All natural waters are therefore somewhat impure, but by usage a water is called pure when it contains nothing injurious to health. In order to arrive at some conclusions regarding the purity or impurity of water, and their relations to health and disease a brief glance at the sources of a water supply are necessary. Most of the water comes from the ocean. At least three fourths of the entire earth's surface is covered with water. The evaporation from the surface of the ocean is the original source of the inland waters. The winds blowing the moisture collect it according to well known meteorological laws and ultimately this same moisture falls as rain, the purest form of water in nature. It contains a certain amount of dissolved gases, nitrogen, carbonic acid, some sulphur, etc., with suspended matters from the air, the rain falling earliest in the shower, particularly after a drought, being very rich in the stuff from the air—dirt, soot, insect remnants, etc. As collected from the tops of houses, etc., such water is at first very filthy. Innumerable sources of contamination by the ordure of birds, dead insects, the dirty dust of the roads, etc., these are all washed down into the cistern. They may not be dangerous to health, but such water is not inviting to the imagination at least. Certain cities have to depend entirely upon such collections for their supply. Special devices for the cleansing and protection of these water supplies are in vogue. Lead containers are to be avoided for such water supplies. Rain falling in semi-rocky and mountainous regions usually gives the best kind of a water supply. There is enough foliage and open rock and stone to well aerate and filter such waters, and forming lakes or springs as they do, such make ideal sources for a water supply. In many regions, particularly in some parts of England and Scotland, peat abounds in such regions, giving a distinct brownish and peaty character to the water supply. The water is perfectly good, but has a much more acid reaction than most natural waters. This renders it an unsafe water to be conveyed in lead pipes as it dissolves this metal readily and causes lead poisoning. Much water falls upon gravel or dirt and collects some 20 to 50 feet below the surface—constituting a subsoil water supply. Most wells use such subsoil waters. These waters in themselves are not necessarily bad, but they readily become so by reason of pollution of the soil by privies, etc., often too near the well. This polluted matter is slowly carried to the water supply and frequently results in the spread of typhoid fever. If one patient should have the disease it might go through a whole township because of one infected well. River waters are usually mixtures of spring waters, surface waters and subsoil waters. Where there is little or no pollution because of no inhabitants in a region, such waters, if clear, are usable, but river waters need constant watching to prevent contamination. Water from deep driven wells is usually very pure. It may be impregnated with salts of various kinds making it unpleasant, but such waters are usually free from the germs of infectious diseases.

The disorders, diseases, etc., that may result from waters may be grouped into two main classes: those causing disease or disorder because of certain chemical constituents in or properties of the water—chemical salts, etc.,

WATER ALDERS—WATER-BEETLES

and those diseases due to infectious micro-organisms, animal or vegetable, which may be in the water used. In the first category there may be included goitre, lead poisoning, zinc poisoning, chronic constipation and diarrhoea. In the second various intestinal parasitic diseases, typhoid fever, cholera, dysenterics, diarrhoeas, etc. The evidence bearing on the relation of goitre to certain chemical constituents in the water supply is not conclusive. The famous case of Bozel reported on by a French commission is of importance. In Bozel in 1848 there was a population of 1,472, of whom 900 had goitres. Saint Bon, a neighboring village, had not a single patient with the disease. The water supplies were different. The Saint Bon water supply was then carried to Bozel and in 1864 there were only 39 persons in Bozel afflicted with the disease. A magnesium limestone formation was the most important factor in the water of Bozel. This was absent in the Saint Bon region. Other investigators in India have thought that the goitre resulted from a parasite found in certain waters. The true status is not yet settled.

Lead poisoning is not infrequent. Many soft waters act on lead piping, particularly in newly fitted houses, and the small amount dissolved often results in the listlessness, anemia, constipation, colicky pains, and even paralysis at the wrists so characteristic of lead poisoning. Kidney disease, stillborn babies, and even insanities may result from such lead poisoning through a water supply. Zinc poisoning has been known, but it is a curiosity. Chronic constipation is very frequently the result of drinking waters impregnated with iron salts and from drinking very hard water, while very soft waters and waters in which there are traces of sulphuretted hydrogen often cause excessive diarrhoea.

The most important water-borne disease, however, is typhoid fever (q.v.). In this, as is well known, the disease is an infectious one. The micro-organism causing the disease, the *Bacillus typhosus*, has found its way into the water supply and from there into the patient's body. It may have come from the drinking water, very frequently from milk, the cans containing which have been rinsed out in infected water; the ice may have been the water infected. Water infection is not the only source of typhoid fever spreading. It is an important one, however, and is the most conspicuous in certain epidemics, but as a rule direct contagion, from person to person, is the most important element in the spread of this disease. Of the means to avoid the spread of this disease, and the modes of contagion, consult *TYPHOID FEVER*. No patient ever gets typhoid from anything else except typhoid. It does not come "of itself." Cholera is undoubtedly a water-borne disease. Numerous practical experiences have demonstrated this—recent epidemics at Hamburg and Altona in Germany having given conclusive testimony. "Drink boiled water" is the watchword in infected cholera or typhoid regions. Everything coming in contact with the alimentary canal should be cooked.

Various parasitic bacteria may cause dysenteric and diarrhoeal disorders. Most instances of epidemic dysentery are examples of water infection. In armies most frequently contact infections, the *Bacillus dysenteriae* of Shiga, is known to be an important micro-organism in the

spread of epidemic dysentery. The most important of the parasitic worms that may be conveyed through drinking water are the round worm and the pin worm, but there are a number of rare parasitic worms thus conveyed. The eggs of both the round worm and pin worm are frequently found in drinking water derived from the subsoil and surface, and even more commonly communicated in vegetables such as lettuce, beet tops, etc., which are not thoroughly washed. Manured garden fields are the prolific sources of the eggs. Other intestinal parasites are guinea worms, whip worms and hook worms, *Filaria sanguinis*, *Bilharzia hematobia* and *Rhabdonema intestinale* are other rarer worms. See *DYSENTERY*; *TYPHOID*; *CHOLERA*; *PARASITES, INTESTINAL*. Consult Harrington, 'Practical Hygiene'; 'Encyclopedia Medica,' article on 'Water.'

SMITH ELY JELLOFF,
Editor 'Journal of Nervous and Mental Disease.'

Water and White Alders. See *CLETHRA*.

Water Balance, an oscillating pendulous frame, having a series of troughs in vertical series and inclined in alternate directions, so that, as the frame oscillates, the water dipped by the lower one shall be poured into the next above, which, on the return motion, shall pour it into the next, and so on.

Water Barometer. See *BAROMETER*.

Water-bears. See *TARDIGRADA*.

Water Bed, a contrivance for relieving any partial pressure of the body of a patient long confined to bed, and so preventing the formation of ulcers which arise from such local pressure. These beds are of various kinds. One form is that of a trough half-filled with water, covered by a loose lining of india-rubber sheeting attached all around to the upper edge of the trough so as to be watertight, a mattress being laid between the invalid and the lining. Another form is that of a large waterproof bag which is laid upon an ordinary mattress and half-filled with water, the weight of the body resting upon this directly or with bed clothes between.

Water-beetles, the numerous species of beetles which inhabit water. A common mode of life does not indicate blood relationship, and the various aquatic beetles belong to a number of quite distinct families. Besides those which are aquatic throughout their lives quite a large number of beetles live in or near the water only during the larval period. The strictly and permanently aquatic beetles belong chiefly to three families. The diving beetles (*Dytiscidae*) are predaceous throughout life and represent in the water the *Carabidae*, to which they are somewhat closely related, on land. The legs in these insects are adapted for swimming, the two hinder pairs being flattened and fringed with hairs. The body is oval and flattened. The mandibles are short and strong, and the thorax is broad. The front legs are short and the antennae long and filiform. In the genus *Dytiscus* the tarsi of the males are wide, flat, and provided with sucking disks, while those of the females are unmodified. Moreover, the females are of two forms, the one having the wing-covers smooth, the other grooved. The head is short, and received into the thorax. *D. fasciventris* is the common water-beetle of our

WATER-BOA—WATER COLOR PAINTING

ponds. These insects carry a supply of air for breathing beneath the *elytra* or wing-covers. At evening they fly in the air. They are eminently carnivorous in habits, and feed on other insects. The larvæ are active creatures, and are also aquatic; their noteworthy rapacity has gained for them the name of water-tigers, which they well merit, for they will not hesitate to seize in their sharp sickle-like jaws any insect-larva, small fish, or tadpole that comes within reach, and after draining its juices discard the dead body. The tail is terminated by a pair of respiratory tubes which are raised above the surface of the water to effect respiration. Besides this large species the family includes numerous small ones having similar habits. The other two families have club-shaped instead of filiform antennæ.

The *Gyrinidae*, or whirligig beetles, have the antennæ short, the front legs long, clawed, and in the males provided with a spongy disk, the second and third pairs of legs very short, broad, and paddle-shaped, and the *elytra* do not cover the tip of the oval body. They derive their familiar name from their peculiar habit of describing circles on the surface of the pools they inhabit. When alarmed these insects dive to the bottom and anchor themselves for a time by means of the strong front legs, carrying with them a small bubble of air on the tip of the abdomen. Owing to the smooth, polished, and oily surface they are unaffected by the water. The facets of the compound eyes are divided into two groups on each side, one adapted for vision in the water, and looking downward, the other for looking upward in the air—an important adaptation to the peculiar mode of life of these insects on the surface. When handled the whirligigs emit from the joints a peculiar strong-smelling milky fluid. Although, like the *Dytiscidae* larvæ, the young of the whirligigs are predaceous and their appearance is totally different; they are of slender form and, instead of a single pair of caudal respiratory tubes or gills, they bear 10 pairs of fringed lateral gills on the sides of as many abdominal segments. Several other genera and species are common in ponds.

The largest of the common water-beetles belong to the family *Hydrophilidae*, which, however, also includes numerous small and inconspicuous species. In the form of the body and the fringed oar-like middle and hind legs they resemble the *Dytiscidae*, from which all the members of this family are, however, at once distinguished by their short strongly-clubbed antennæ. The eggs are deposited in silken cocoons which are attached to water-plants or carried by the female. In general resembling the water-tigers in form, the larvæ have shorter, thicker, solid jaws, much less prominent respiratory tubes, and are much less active, although, like them, carnivorous. They pupate in burrows in the banks of the ponds which they inhabit. The great water-beetle (*Hydrophilus triangularis*) is a pitchy black polished beetle an inch and a half long, often seen flying at night, or during the day rising to the surface of clear weed-grown ponds for air and, unlike the *Dytiscidae*, usually resting head upward. In adult life they forsake the predaceous habits and animal diet of their larvæ and become scavengers, finding their food chiefly in the vegetable debris at the bottom of ponds. Few inhabitants of fresh-water ponds and ditches are better suited to life in an aqua-

rium than these beetles and few present a greater variety or more interesting habits.

Consult standard works, especially Miall, 'The Natural History of Aquatic Insects' (New York 1895). See FRESH-WATER INSECTS.

Water-boas, the anaconda snake. See BOA.

Water-boatman. See BOAT-FLY; WATER-BUG.

Water Brash. See PYROSIA.

Water-bug, an aquatic bug of the hemipterous family *Notonectidae*. The hind legs are long, and adapted for swimming by being provided with a fringe of stiff hairs. The body is prismatic in form, convex above and flat beneath, and the head is as large and as wide as the body. *Notonecta* is the typical genus of the family and *N. irritata* and *undulata* are two of the common species. These and others abound in ponds and streams, where they rest on their backs at the surface, occasionally striking out with a vigorous oar-like movement of the hind legs, or dive to the bottom and cling to plants or stones. They are constantly buoyed up by a film of air which surrounds the abdomen, partly entangled in a coat of close fine hairs, partly held between the wings and the abdomen in a space into which the spiracles open, and partly between the joints of the abdominal and thoracic segments. On land the water boatmen are at a disadvantage and progress by a series of spasmodic leaps; but they are agile fliers. As larvæ, nymphs, and imagoes they are predaceous and, besides strictly aquatic insects, young fishes, etc., they attack and suck the juices of flying insects which happen to fall into the water or approach its margin to drink. Various other hemipterous insects, such as the water scorpions (q.v.), are aquatic.

Water-clock. See CLEPSYRA.

Water Color Painting, in contradistinction to oil painting the use of water generally interfused with gum arabic as a vehicle for applying colors, very often transparently, to a white surface. Anciently, there were three distinct methods of water color painting, and these were known as tempera, encaustic and fresco. Tempera, or as it was sometimes called, Distemper painting, was common in early Italian art. (See PAINTING.) The colors were ground and mixed with the beaten-up white and yolk of an egg, or with the white juice of the fig tree, and sometimes with ox-gall. Encaustic painting (q.v.) was a process in which the colors were fixed by means of wax laid in a thin coating by the application of hot irons. The early Flemish and Dutch painters attained considerable success by the use of water colors in the shape of tempera, long previous to the invention of oil painting by the Van Eyck brothers. The Italian frescoes painted in water color, on damp plaster, have retained their colors scarcely impaired for centuries. (See FRESCO PAINTING.)

But when we speak of water color painting in a modern sense we refer rather to that which has been inaugurated since the discovery of oil painting and brought to great perfection by the modern schools of European painting. This style of water color painting has generally, almost universally, been executed on white paper. It is not too much to say that in England has been the first great field of water color painting. In the English school there has been

WATER COLOR PAINTING

no exclusive use made of what is known as body color. The lightness and darkness of each tint have generally been determined by the degree of their dilution with pure water, not by their modification through an admixture of Chinese white. Yet the old water color painters resorted to the pencil or the pen in finishing their drawings. They employed a great many varied kinds of paper; some of it was rough while sometimes it was perfectly smooth. In many cases tinted paper was used and the high lights picked out with Chinese white. In no case was a water color drawing begun before the paper had been stretched and sponged.

In early painting the pigments employed were generally mineral earths or juices pressed from plants. The colors found in antique frescoes were few but permanent in value. In the Middle Ages chemistry came to the aid of the fresco painter and supplied him with many brilliant and permanent tints, which in some instances vied with the lustre with which the church window maker annealed his glass. The modern water color painter has gained innumerable additions to the color gamut of his palette, and the freshness, crispness and unerring certainty of his touch have been largely due to the beauty, clearness and permanency of the colors in which he has worked. Manufacturers have, indeed, vied with each other in providing him with pigments which shall flow smoothly from his brush and stand projected with unclouded lustre upon his paper. While the modern water color painter aims at producing his effects by means of transparent washes in large and elaborate pictures, artists have not always considered it illegitimate to resort to the use of body color in their efforts to impart to their work the depth and solidity of oil painting.

The history of modern water color painting begins, as we have seen, in England, and the earliest precursor of the modern school was Francis Barlow (1626-1702). He painted birds and animals with appropriate landscapes, cleverly set in. In some ceilings which he decorated, birds were seen flying through the air; his drawing was spirited, but he was not a good colorist. Michael Angelo Rooker (1743-1801) was an early water color painter of landscapes and buildings and was principal scene painter at the Haymarket Theatre; he was a fine draughtsman and finished his work with such care and taste as give him a high place among early water color artists of England. This art was much advanced by Thomas Hearne, who used the pen much less freely than his predecessors, employing it with a delicacy which gave beauty of detail to the architecture and ruins which he generally chose as subjects of a pencil devoted entirely to water colors. William Payne (1760-1830) put this branch of art on a new footing, and first acquired that direct facility and dexterity of execution so requisite in the use of this vehicle; his works are also brilliant in color, and there is a breadth of treatment in sunlight effects, and in the contrast of warm tints and grays which established a precedent. John Robert Cozens (1753-1799) was the precursor of Girtin and Turner. His range of color was, indeed, narrow; he used Indian red, lake, indigo, yellow ochre, burnt sienna and black, yet Constable pronounced his works to be lovely, and he first taught the world

how atmosphere and sky can be rendered in a manner truly vivid and poetical, as the result of skilful handling. His pictures of Italian as well as of London scenery must be pronounced powerful. But, perhaps, Robert Girtin was the first to show the full power of this medium. He well-nigh entirely changed the practice of the art, and his pictures, which were made direct from nature, had a richness and depth of color, a clearness and transparency, which resulted from his method of first laying on in washes the fine local color of the objects before him, and then deepening the shadows with their own individual tints, as they shone before his eyes. His method was adopted by John Sell Cotman (1782-1842), whose landscapes and marines are some of the best productions of the Norwich School. Figure painting in water colors reached its first perfection in the works of Joshua Cristall (1767-1847), who was one of the foundation members of the Water Color Society. His early subjects were classical, but as he advanced in life he drew figures and scenes from country life, peasant girls, fishermen and landscapes, all executed in a direct, honest manner without the use of body-color or other doubtful expedient. More dramatic and sensational were the scenes of banditti, or of poetic romance, painted in water colors by Henry Liverseege—a worthy successor to Cristall in the simple and frank use of his vehicle, though his painting, in spite of powerful and brilliant coloring, was sometimes overstrained and coarse.

The full capacity of water color painting was not known before the pictures of Joseph Mallard William Turner (1775-1851), an early student of John Cozens's works, and a friend of Girtin, were exhibited to the world. His early water colors were, indeed, low in tone and gloomy, though forcible and convincing. What he came to do in the way of color is shown best in his Venetian studies, originally made on the spot in water colors. Turner, however, did not confine himself to the water wash; when he thought it necessary he employed body color in parts of his work, and even, on occasion, pastels; or it may be pencil or pen. But he never revealed to any one the secrets of a technique which made him the greatest landscape painter in water colors which the world has even seen. The foundation of the Old Water Color Society, in 1800, and of the New Society, in 1863, gave a great impulse to the art among whose representatives may be mentioned Fielding (d. 1855); Peter de Mint (d. 1849); Prout (d. 1852), the master of architectural painting; Cox (d. 1850), and the brilliant executor of oriental genre, Lewis (d. 1876). Taylor and Landseer, as animal painters, found this a successful and pliant medium, and among the Pre-Raphaelites who were eminent aquarellists may be mentioned Rossetti, Madox Brown, Burne-Jones, Holman Hunt and Millais.

In France, among able landscape painters in water colors, were conspicuous L. B. Labey (1767-1855); Hubert, J. Ouvrié, Sué and Fort. They pretty generally employed body color (*gouache*) in their composition, the transparent wash being much less frequently employed in France. In portraits, Olivier Grand; in flower painting and still life, Redonté (1759-1840), the

best painter of this class France has ever produced. But the art was not tried to its full capacity until the oriental sketches of Eugene Delacroix (1798-1863) proved to the French art world that there was something to be sought for fresher and more inspiring than the frigid classicism of David. His lead was followed by Descamps (1803-60), one of the best colorists and most original painters of the modern French school, who taught his countrymen that it was possible to represent in water colors the broad blaze of open sunlight in an African sand-plain; or in the streets of Smyrna and Constantinople. The powerful genres of Gavarini (1804-66) made a sensation even in England, the native home of water colors.

The German school of water color painting began with the illuminating or tinting by hand of copper plate engravings. An independent and distinct department of aquarelle came late in the history of German art. The first notable aquarellists in that country were Karl Werner of Leipsic, and Edward Hildebrandt of Berlin—Viermann, Otto, Graef of Berlin, Heindrich, Stöckles, R. Stieles of Munich, and a circle in Düsseldorf, including Scheuren and Mintrop, kept up the old traditions of German water color painting. A new path was struck out by Menzel, who obtained a great following. He adopted a broad, frank and dashing style which was much admired. The Berlin painters, such as Franz Skarbina and Paul Mayerheim, vied with him in this method of handling. But German aquarelle has never been distinguished for the lightness of touch, the brilliant and transparent coloring, the powerful and vivid landscape effects which we find in the productions of English and French artists. Italy and Russia on the other hand have many skilful practisers of this art. The vivid coloring of such masters as Corelli, Zezzola, and Mainella has a light and lustre all its own and the creations of these painters are worthy of comparison with many of the most eminent workers in their own department of art in other parts of Europe. The same may be said of the Russians, Benken-dorf, Bergholz, Karafin, Hefler, Jegornow, Pissemski, and Ehreoon.

Water color painting has always formed a very living section of American art life. When Vassili Verestchagin, the great Russian war painter, was in America, he was astonished, according to his own account, that native artists were not more alive to the possibilities of American scenery and American life as subjects for the pencil. He was not sufficiently acquainted with the history of art in the country to which he had come a stranger, to be aware of the fact that local art had long flourished there. The Hudson River School of painters produced many noble transcripts from the scenery of that river, mostly in large canvases, and by employing oil as a favorite medium, but several of them have also executed gems of art in water colors after the style of the best masters. Among those who have done some good water color sketching among the sublime scenery of the West may be named Albert Bierstadt, some of whose views are correct in drawing and rich in coloring, albeit they owed their original impressiveness to the novelty of the effects in atmosphere and mountain contour or coloring which they reproduced.

The same in a less degree may be said of the drawings of F. E. Church. Neither of these painters was, however, as triumphant in water as in oil. The New York Water Color Club has done much to foster a revived interest in this most difficult yet most effective and delightful department of the painter's art, and among the most successful of those who cultivate it may be enumerated, Abbey, Moran, Par-ton, Murphy, Parsons, Shurtleef, Tryon, etc. Louis C. Tiffany is a colorist of rare gifts, and although his natural predilection leads him to the representation of still life, yet his water color landscapes have a value of their own. Charles Sanderson is well known for his lovely water color studies of the shores of Lake Michigan. At the end of the 19th century there was suddenly a new movement developed in this department, principally through the influence of John H. Twachtman, whose early death was a sad blow to the cause he had most at heart in his native country. In 1898 the Ten American Artists crystallized into a new school of painting in New York. As far as this movement was represented by Twachtman it stood for a distinct advance in water color art. There can be no doubt that he reflected in the practice of his art the very best features of that style which in Europe was embodied in the work of Girtin, Cozens, and Turner. Water color painting in the United States numbers among its devotees many other great names. Homer D. Martin's few water colors are of the highest value. Frederic Crown-inshield shows in his water colors a noble sense of the form of hills and cliffs, and the greater forms of the landscape, as well as of tree-form. Winslow Homer's many water colors are about as important a contribution to American art as any other group of works. They are extremely vigorous and powerful, they sell at high prices, and among lovers of modern painting there are certainly none more esteemed. Winslow Homer is essentially a "painter's painter," and no single artist in the whole group is more admired by his fellow artists. John La Farge's water colors are what have chiefly made his great reputation. There are hundreds of them in private collections in Boston, New York, and neighboring towns, and the show of the South Sea Island collection, at the Paris Salon in 1898 or 1899, occupied a hall especially set aside for it, and made a great sensation. There is nothing in modern art more rich in color than these La Farge drawings, which have been produced during the years from 1865 to 1895, chiefly; for since that time he has been too much absorbed in decorating work, glass, and the like. The work of Robert F. Blum and that of Irving R. Wiles commands the admiration of their brother artists. Francis Hopkinson Smith is a master of loaded color, that which is mixed with white (the French *gouache*). There are women artists who excel in water color work of each kind.

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Water Color Society, The American, a society of artists for the promotion of water color painting. Its headquarters are in New York, where the majority of its members reside. The membership in 1904 was 100.

Water Cress, Winter Cress, etc. See CRESS.

WATER CURE—WATER-HEMLOCK

Water Cure. See HYDROTHERAPY.

Water-dog, a salamander. See MUD PUPPY.

Water-Dropwort. See DROP-WORT.

Water-flor. See CLADOCERA; CYPRIS; DAPHNIA.

Water Gap. See DELAWARE WATER GAP.

Water-Gas, a mixture of gases produced by the action of steam on incandescent carbon. The carbon first decomposes the steam, forming hydrogen and carbon dioxide, and the latter gas then combines with more carbon to form the inflammable carbon monoxide. Thus water-gas is mainly a mixture of hydrogen and carbon monoxide. Pure water-gas is non-luminous, but it is rendered luminous by mixing with various gases obtained from petroleum, the luminous mixture being known as carburetted water-gas. Two chief methods are employed for the manufacture of water-gas for illuminating purposes. In the first of these, the Lowe process, the preparation of the pure gas and the carburetting are performed in one operation. The apparatus consists essentially of a generator, filled with anthracite or coke, in which the non-carburetted gas is produced; a carburetter, a circular chamber lined with firebrick and filled with a checker-work of the same material; and a superheater, a taller circular chamber similarly filled. By means of air-blasts and the producer-gas from the anthracite of the generator, the fire-bricks of the carburetter and the superheater are raised to a red heat, and then superheated steam is passed through the incandescent carbon. The water-gas formed passes over into the carburetter, where it becomes mixed with illuminant gases formed by the action of the heated bricks on mineral oil, which is introduced from above. This process is completed in the super heater, and the carburetted gas is then ready for purification. In the Wilkinson process the operations of making the gas and carburetting are separate. In the United States carburetted water-gas has largely replaced coal-gas as an illuminant, partly because of its brighter light and partly because it can be more cheaply manufactured in that country. Coal-gas is often mixed with carburetted water-gas in order to increase its illuminating power. The chief objection to the use of water-gas as an illuminant is the highly poisonous nature of one of its essential constituents, namely, carbon monoxide. Water-gas is also used in the non-carburetted condition as a fuel. See GAS.

Water Glass, a substance which, when solid, resembles glass, but is slowly soluble in boiling water, although it remains unaffected by ordinary atmospheric changes. It consists of soluble silicates of potash or soda, or a mixture of both. A substance of this kind was first discovered, so far as is known, by Van Helmont in 1640. In the 19th century Dr. Johann Fuchs of Munich did much to improve the mode of preparing and applying it. Water-glass may be prepared in two ways, called wet and dry. The former mode of preparation consists in breaking down and calcining flint nodules, the fragments or particles of which are then added to a solution of caustic potash or soda, whereupon the whole is exposed for a time to intense heat at 60 pounds pressure. According to the latter method the constituents are fused together in the solid state and afterward dissolved. The

product when prepared in this way is viscid, and may be used in this state or further diluted. In this method of manufacture the caustic soda or potash may be replaced by the carbonate or the sulphate. Potash water glass is more soluble than soda water glass, and if both metals be present a still more soluble glass, called double soluble glass, is obtained. Among the purposes to which water glass is applied are painting on glass, coating stone, wood, and other materials to render them waterproof, glazing scenery, and paintings, etc. It is also used mixed with sand to make an artificial stone, and it forms an ingredient in some kinds of cement. One of the most valuable of its applications is in the fixing of wall-paintings, which are more durable fixed by means of it than by the ordinary process of fresco-painting.

Water Hammer, the name applied to a vessel partly filled with water, exhausted of air and hermetically sealed. When reversed or shaken, the water, being unimpeded by air, strikes the sides with a sound like that of a metal striking against glass.

Water-hemlock, deadly poisonous plants (*Cicuta*) of the carrot family, known also by many other names, such as beaver-poison, spotted parsley, muskrat-weed and musquash-root, the latter names being borrowed from the muskrat, which inhabits such swamps as the *Cicuta* affects; and the odor of the roots of certain species of the latter also recalls the musk-scented rodent. *Cicuta maculata* is a tall biennial, reaching 8 feet in height, with a rigid, hollow stem marked with purple lines, that grows in swamps and wet lands throughout the northeastern United States. The leaves are decomposed, even three-pinnate, having coarsely serrate leaflets, with veins apparently ending in notches instead of at the points of the teeth, as in ordinary foliage. The flowers are very tiny and white, in decomposed, terminal umbels, with unequal pedicels. The fruits are ovate-oblong, glabrous, and slightly flattened laterally. The ribs are corky, the lateral ones being strongest. Spindle-shaped, tuberous roots cluster about the base of the stem, and are the cause of many deaths. They have an aromatic flavor, and fleshy substance, and are frequently mistaken, especially by children, for the roots of sweet-cicely, parsnips, artichokes, or even horse-radish, and are sometimes eaten for no particular reason except that they are fleshy and exposed by washouts, freezing, or digging-operations. Even live stock are killed, not only by feeding on the tubers themselves, but by drinking water poisoned by roots which have been crushed under the cattle's hoofs. The poisonous element in this *Cicuta* is an aromatic oily fluid, which permeates the whole plant, but is found chiefly in the roots, and probably contains the alkaloid conine, and the bitter principle cicutoxin. When eaten *Cicuta* produces vomiting, colic, staggering and unconsciousness, and finally, frightful convulsions which end in death. No chemical antidote being known, the only treatment possible is to cleanse thoroughly the digestive system, and treat each stage of the attack, with such medicines as seem necessary. Cattle may sometimes be saved by timely and repeated doses of melted lard. The western water-hemlock (*Cicuta verna*) has a fleshy root with a "vertical root-stock, from 1 to 6 inches long by 1 to 2 inches

WATER-HEN — WATER-LILY

thick, and is curiously divided into numerous chambers by horizontal partitions.⁹ The root is filled with tubes from which an aromatic oil exudes. Solid fleshy fibres are sent out from this rootstock, near the surface of the soil. Very small pieces of the rhizome are fatal to men or cattle, many of the latter being killed each year by it. The elongated, spindling-roots of the Wyoming water-hemlock, *Cicuta occidentalis*, which in Montana is known as the wild parsnip, has a characteristic musky odor, and stock are poisoned either by the young plants or by the roots. Other species of *Cicuta* have a similar appearance above ground and are equally poisonous.

Water-hen, or Moor-hen, a rail (*Gallinula chloropus*), generally distributed throughout Europe, Asia, and Africa. Its length is about 13 inches; back, wings, rump, and tail rich dark olive-brown; head, neck, breast, and sides dark slate gray; thighs and flanks streaked with white, belly and vent grayish white; beak yellowish, becoming red; naked patch on forehead red; legs and toes greenish-yellow, claws dark-brown. The female is rather larger and more vividly colored than the male. They frequent ponds covered with aquatic herbage, overgrown water-courses, and the banks of slow rivers, swimming and diving with facility, assisted by an expansion of the membrane along the sides of the toes. The water-hen is representative of the sub-family *Gallinulinae* of the rail family (*Rallidae*) which comprises 30 or 40 species found in all parts of the world. In the United States they are generally known as gallinules (q.v.) or mud-hens, and are represented by the purple gallinule (*Poronotus porphyrio*) and the Florida or common gallinule (*Gallinula galeata*).

Water-hickory. See HICKORY.

Water Inch, in hydraulics and irrigation, a measure of water equal to the quantity discharged in the 24 hours through a circular opening of one inch diameter leading from a reservoir under the least pressure, that is, when the water is only so high as to cover the orifice. This quantity is about 500 cubic feet.

Water-lily, a flower of the aquatic family *Nymphaeaceae*, especially of the genera *Castalia* and *Nymphaea*. These are found in fresh, still waters throughout the warm and temperate regions, and are often cultivated. Some can be easily raised from seed, and those which are hardy in the north, will stand a very low temperature without damage, even to be encased in ice. They may be grown in tanks, or even in half-barrels, as well as in ponds; but the tropical species, such as *Victoria regia*, require the warmth of a greenhouse, or heated tanks, in our northern latitudes. The water-lilies are handsome plants, having more or less orbicular, generally peltate leaves, either floating or, more rarely, immersed, and solitary flowers, of similar varying habit. These blossoms have several sepals and many petals, stamens, and carpels, the latter distinct, united, or immersed in a thickened receptacle; in color they may be white, pink, yellow, or blue, and are sometimes very fragrant. The fruit is indehiscent, somewhat fleshy, and like a giant berry filled with nuts, or, in the case of *Nelumbo*, the nuts are half sunk in pits in the flat-topped, enlarged

torus. The seeds are large with fleshy cotyledons and are naked, or enclosed in pulpy arils. Water-lilies, even in the time of Pliny, were considered to be an antidote to love-philtres. The most famous of them is perhaps the giant or royal lily, *Victoria regia* (q.v.). Another, which is very large, is the Australian water-lily (*Castalia [Nymphaea] gigantea*), which is one of the finest of its genus. Its flowers are sometimes a foot across, with hundreds of stamens, and the color is blue, or even other tints. They do not close so completely at night as do other water-lilies. The Egyptian lotus that was a favorite plant (*Castalia mystica*) of the ancient Egyptians is often confounded with the Indian lotus (*Nelumbo*), but is really a blue-flowered water-lily, formerly known as *Nymphaea lotus*. It was a valuable plant to the decorators of that country, who copied it, and conventionalized its form in many of their architectural ornaments, and also introduced it constantly into their painted pictures of life and customs. Its rootstock and seeds served as a food. (See LOTUS.) The European water-lily (*Castalia alba*) is similar, but has white flowers that are apt to open a little above the surface of the water, being supported on a stiff petiole. The flowers are not fragrant, as are those of the American pond-lily (*Castalia odorata*). The latter lovely lily rides upon the water, with creamy-white petals radiating in circles, the inner gradually narrowing, and passing by various stages into golden stamens in the centre. They expand in sunshine and close in the early afternoon. The fruit is ovate and baccate, and ripens under water. The leaves, or lily-pads, a favorite food of deer, are ovate-orbicular, with a deep sinus, and have very long tubular stems of unvarying thickness, great flexibility, and toughness. The thick, fleshy creeping rootstock furnished a brown dye for the early settlers, and was also used as a styptic and tonic. A variety of this lily is smaller, and has rose-colored flowers. There are several other species of *Castalia* in the United States, including the handsome golden-flowered lily (*C. flava*) of Florida.

One of the most common water-lilies is the yellow pond-lily (*Nymphaea*, or *Nuphar advena*) which blooms all through the summer, but is not very beautiful. The leaves are ovate, or orbicular, with a deep sinus at the cordate base. They may be either floating, or erect, especially when the plant grows in tidal streams, and is likely to be left standing nearly out of water, upon the ebbing of the tide. These pond-lilies also are known as spatter-docks and frequently join with pickerel-weeds in obstructing a boat's passage to the shore, along which they stand in an extended ribbon. The flowers are flattened globes, made up of half a dozen thick, golden sepals, arching over the stamen-like sepals. The fruit is ovoid, somewhat constricted at the neck, and contains edible seeds. The strong-growing Pacific-coast representative of the spatter-dock is the *Nymphaea polycephala*, known to the Klamath Indians as *wokas*. It is very like the eastern species. When fully mature, the large pods burst open irregularly at the base, and the entering water, when it reaches the white, mealy interior in which the seeds are imbedded, at once starts a mucilaginous dissolution of it, which frees the seeds, and allows them to sink into the water. These seeds were once a staple

WATER-LOCUST—WATER METERS

farinaceous food of the Klamath Indians, and are still a favorite delicacy among them. The squaws betake themselves in canoes to the lily-patches, and pluck the full-grown pods, while still hard, or scoop out those already dissolving with a wicker spoon. The latter are the more prized, and are deposited in holes in the ground, where the pods ferment, and turn into a mucilaginous mass from which the seeds may be freed by washing. Or the seeds may be extracted by other methods. They are then prepared in various ways for eating, either as mush or meal, or merely parched; they are delicious cooked in this manner.

Nelumbo nelumbo is the Indian lotus; *Nelumbo lutea* is the American or yellow lotus, of the Middle West. It is also called water-chinquapin, on account of its edible seeds.

Consult standard authorities, especially Bailey, 'Cyclopædia of Horticulture' (New York 1898).

Water-locust. See LOCUST TREE.

Water Mark. (1) The mark or limit of the rise of a flood or the mark indicating the rise and fall of the tide. (2) In paper-making, any distinguishing device or devices indelibly stamped in the substance of a sheet of paper while yet in a damp or pulpy condition. The water marks used by the earlier paper-makers have given names to several of the present standard sizes of paper, as pot, foolscap, crown, elephant, fan, post.

Water Meters, instruments by which the quantity of water or any other liquid flowing through pipes is measured and recorded automatically. They are of three general types—the "positive," the "inferential," and the "proportional" meters.

Positive meters measure the actual volume of the water, by the action of a piston working in a cylinder which is successively emptied and filled at the completion of each stroke. The cylinder being of known dimensions affords a measure of the quantity of water introduced in a given interval of time. The pistons are either reciprocating or rotary, or of the oscillating or gyrating disk patterns, and they may be single or double. When single, a weight or spring produces the return stroke, but in the case of the double arrangement, the reciprocal action of the two pistons is controlled by the action of each other, as in the case of a duplex pump. In rotary piston meters, which may also be of the single or double type, the pistons have interlocking faces and revolve in an air-tight chamber. Upon the outer surfaces of the pistons are a series of projections and recesses which correspond to similar shapes on the inner walls of the cylinder. The pressure of the flowing water causes the piston to revolve so that a series of recesses or chambers in the cylinder are successively filled and discharged from the inlet to the outlet of the meter. When oscillating or gyrating disks are employed in the place of pistons, the wobbling motion of the disks alternately empties and fills the cylinder. Inferential meters measure the velocity of the flowing water by recording the revolutions of a turbine or other water-wheel attachment, and the quantity is deduced by computation from that record. Proportional meters measure a fractional part of the full flow and are therefore capable of being set on a small by-pass pipe which

branches from and subsequently rejoins the main pipe, but their use is quite limited.

The registering mechanisms consist of a series of cog-wheels and dials. The flow of the water actuates the cog-wheels, and the number of revolutions are recorded on the dials. The arrangement of the mechanism converts the number of revolutions into any desired unit of volume, so that the reading of the dials is termed straight and gives the quantity direct, in cubic feet, the unit generally adopted, particularly in the United States.

The working parts of meters are made light and durable. Serviceability and accuracy are the qualities required, and in their design the support of the water pressure is employed to reduce to a minimum the loss of head, and the wear and tear of the working parts, and although a high degree of accuracy is not generally required, the meters are made sufficiently sensitive to measure the small flows incident to leakage. Hard rubber is generally used for the disks, and also for the rotary pistons of some meters, but where the liquids are hot, or consist of chemical solutions, brass is generally employed. Possible damage due to clogging by the introduction of fish or gravel, is prevented by various forms of strainers and sieves, while effect of frost is guarded against by frost cases.

There are several forms of meters which do not come under the general classes already described. Of these the "Venturi," constructed by Clemens Herschel of New York, in 1886, is the superior and most useful on account of its simplicity and durability. Its basic principles—the relation between the reduction of pressure and the increase of velocity of water flowing through a contracted pipe, was discovered by Venturi in 1796. In construction it consists of two conical shaped pipes with their smaller ends joined together by a collar or throat-piece, resulting in a shape similar to a pipe contracted at one point of its length. By gauging the pressure of the water at a point just before, and also directly at the point of contraction, and the relation of these pressures to the diameter of the pipe, the volume of the flow is computed. The tubes are usually constructed of cast iron or riveted steel, but they may also be constructed of masonry or wood. The length of the meter varies from 8 to 16 times the diameter of the uncontracted portion, while the diameter of the contraction ranges from one fourth to one half of the full diameter of the tube. They are made in sizes varying from 2 to 94½ inches, with practically no limit to the possible maximum size, but for practical use where meters of diameters less than six inches are required those with moving parts are cheaper. Waste-water meters are employed in connection with water works to measure the rate of consumption per unit of time, instead of the total volume. They consist usually of a disk placed horizontally in a cone-shaped chamber. The disk is lifted or lowered according to the greater or lesser volume of water passing through the pipe in which it is set, and being connected by a wire with a counter weight and pencil which follow the movements of the disk, records the nature and amount of those movements on a paper carried by a drum which is revolved by clockwork. The vertical rulings of the record sheet indicate the time intervals, while the horizontal lines

WATER-MOCCASIN—WATER MOTOR

represent the units of volume. Since all the water consumed in a given district must pass through such a meter, by comparing the rates of consumption of the various districts, the causes of abnormal waste are readily determined and localized.

Another form of water meters, more particularly known as current meters, are employed in hydraulic engineering to measure the velocity and volume of flow of the waters in rivers, large aqueducts, and sewers. See **CURRENT METERS**.

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Water-moccasin, a snake. See **MOCCASIN**.

Water Motor. In its broadest sense the term is applicable to all forms of machines or systems of machinery operated by water under the force of gravity, or in other words, by which the energy inherent in a natural waterfall is utilized to perform mechanical work. Of these machines, the water-wheel (q.v.), the turbine (q.v.) and the pump (q.v.), have been treated under their respective titles, but in this article the term will be considered as designating those machines which are operated by the element of pressure only, such as hydraulic lifts and water-pressure engines.

The Hydraulic Lift is the simplest of all water motors. The direct-acting lift consists of a cylinder in which a ram or piston of equal length, with a cage attached to its upper end, works up and down. The level of the water supply is necessarily above that of the maximum height to which the cage may be lifted, so that when the water is admitted to the cylinder through its lower end, the pressure forces the ram upward and thus lifts the cage. The descent of the ram is accomplished by closing the supply valve and opening the discharge valve, the ram descending by its own weight. As the weight of the ram is greater than necessary to bring down the cage, a part of that weight is balanced by a weight attached to the end of a chain that works over a pulley at the top of the lift and is connected to the cage. The most familiar examples are the high-speed hydraulic passenger elevators. They are operated by the pressure of water pumped into tanks situated on the roofs of the buildings in which they are installed, while the operating machinery is located in the basement. (See **ELEVATOR**.) The hydraulic press and the hydraulic ram are devices operated practically under similar principles. In the former, the action depends upon the principle of hydrostatics that a pressure applied to any part of the surface of a liquid is transmitted in all directions, and throughout the mass without diminution. For example, if a cylinder filled with water has a plunger one inch square working through one end, and another ten inches square working through the other end, and a pressure of one pound is exerted on the smaller plunger, this pressure will be transmitted to the larger plunger, and be delivered by the latter in a multiplied amount equal to the square of its face area expressed in pounds. In this example that pressure would be 100 pounds. Such presses consist essentially of two cylinders connected by piping. The pressure is applied to the plunger of the smaller cylinder, and the multiplied pressure is transmitted by that of the larger to the

object to be raised or pressed. In construction they vary greatly with the purposes for which they are employed. Those used as hay, cotton and oil presses, consist of four strong iron pillars arranged in the form of a square, which carry a cast-iron plate solidly attached to their tops. A similar casting is situated at the bottom of the pillars. Through a circular hole in the centre of the lower plate, a plunger carrying a square platen on its head, works with an upward motion and presses the material placed between the platen and the under face of the top plate. In presses used for hydraulic forging, the cylinder and plunger are carried by the top plate, while the bottom plate carries the anvil. The plungers work downward in the act of pressing or hammering. They are made of various sizes, and are generally provided with two pressure plungers and cylinders, and they are adapted for purposes varying from the manufacture of revolver cartridge cases to the forging of armor plate, guns, and steamship shafts. Armor plate presses capable of exerting a pressure of 14,000 tons are in use, while 7,000-ton fluid compressors are employed in many of the larger steel manufacturing plants. A brief description of the construction and working of one of the last-named capacity will serve to illustrate the mammoth proportions and enormous power of these machines. It consists of an upper head weighing 120 tons carrying the plunger, and a 135-ton base plate containing the hydraulic cylinder. These are supported and held in place by four vertical connecting columns each 50 feet long, and 19 inches in diameter. In operation, the molten metal is poured into a mold built up in sections, and the mold is raised under a hydraulic pressure of 7,000 tons, while a plunger attached to the upper head bears down upon the fluid metal and compresses it.

Hydraulic Ram.—In the hydraulic ram the force of water flowing by gravity is utilized to raise a portion of itself to a height above that of the source of supply. Two pipes are employed. The water in flowing through the main or drive pipe acquires sufficient momentum to close a valve at the foot of the pipe, and the water thus confined automatically opens another valve, partially fills an air chamber situated over the foot of the main pipe, and compresses the air in it until the pressure within balances the column of water in the main pipe. Then, the foot valve of the main pipe opens again and the action described is repeated. In the meantime, the pressure in the air chamber forces the water through a small service pipe leading out of its bottom, to the required height. See **HYDROSTATIC PRESS**, **HYDRAULIC RAM**, and **PUMPS AND PUMPING MACHINERY**.

Hydraulic Engines.—In the hydraulic lifts or elevators, the admission and discharge valves are worked by hand at the will of the operator, but in the engines the mechanism actuates the valves automatically and periodically, thus converting the lift into a machine with a continuous action. Unlike the vertical water wheels and turbines, the efficiency of which depends upon the weight of a large body of water falling from a comparatively small height, the water engines work under the pressure of a small column of water descending from a considerable elevation. They are of three types—the "single action," in which a piston working in a cylinder is moved upward by the pressure of the water,

WATER-MOLDS—WATER-POWER

and downward by the weight of the piston itself; the "double action," in which the cylinder is closed at the top as well as at the bottom, and the water admitted to it by supply pipes at those points, acts reciprocally on the piston from above and below; and the "rotary," in which the water pressure acts on a revolving piston similar to that of a rotary steam-engine. Rotary engines may be of the single-acting or double-acting type, the advantage being with the former, since the pressure of the piston is always exerted on the crank pin in one direction, and the dead centres are passed without knocking. Generally three single-acting cylinders formed in one casting are used in connection with a disk valve with segmental ports which pass over corresponding apertures in the valve seating during rotation, and the engine will readily start in all positions. The first engine of this kind was constructed by Sir William Armstrong, who also subsequently designed one of the reciprocating pattern. Since then a great variety of hydraulic engines have been invented, the greater number of them being of the last-named type. They have a wide field of usefulness, especially as auxiliary motors for driving small machinery such as hoists, swing-bridges, capstans, cranes, winches, etc. The employment of superheated water motors is one of the latest developments in the methods for railroad traction. In the earlier forms of engines operated by superheated water, the storage tank being charged with water at a temperature corresponding to several hundred pounds of pressure, the steam from the water was utilized in the cylinders of the motor in a manner similar to the utilization of steam from the boiler of a locomotive engine by expansion in its cylinders. Their operation was based upon the relation of temperature and pressure to the vaporization of liquids, and the steam was drawn off from its point of formation at the top of the storage tank to the cylinders. Under these conditions, new steam was supplied by water which boiled at lower and lower pressures and reduced temperatures, until the pressure fell to a point at which it was not available for use in the motor, and only about one ninth of the energy of the heated water was actually used in the cylinders. About 1888, W. E. Prall of Washington, D. C., suggested the utilization of the heat in the storage tank by withdrawing it in the form of water from the bottom of the tank instead of steam from the top, and allowing the water thus withdrawn to give up its heat within the cylinders of the engine itself. In the latest motors, this is accomplished by a generator composed of a nest of tubes coupled into manifolds at the top and bottom. The working pressure is about 700 pounds to the square inch, and the water is drawn off from the generator into three insulated storage tanks with a total capacity of 7,000 pounds, carried beneath the car. From the bottom of the tanks the water is delivered through three Tappet valves provided with screw and nut adjustment, to regulate the amount of feed. In operation, under the decreasing pressure caused by the movement of the piston through its stroke, the water resolves into steam in a continual series of flashes, while the steam and the unevaporated portion of the water from the high-pressure cylinders, pass out through the ports in its bottom, and is drained off through valves located in the lower face of

the valve chest. The exhaust steam from the high-pressure cylinder passes in the ordinary way to the low-pressure cylinder, from which it is finally exhausted, into the atmosphere. It is estimated, that a car equipped with two compound engines and three tanks charged with water at a pressure of 700 pounds to the square inch, and a corresponding temperature of 500°, will be capable of running 40 miles at a speed of from 30 to 40 miles an hour.

Bibliography.—For specific and detailed information consult the various engineering magazines; also Bodmer, 'Hydraulic Motors, Turbines and Pressure Engines' (1899); Weisbach, 'Mechanics of Engineering, and Hydraulics and Hydraulic Motors' (1877). W. MONEY, JR.,
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Water-molds. See FUNGI.

Water-ouzel. See OUZEL.

Water-plane. See WATERS, UNDERGROUND.

Water-plantain, an aquatic or marsh herb of the genus *Alisma*, family *Alismaceae*, of which *Sagittaria* (q.v.) is also a member. The plant most commonly known as water-plantain is that found also in Europe and Asia (*Alisma plantago aquatica*), which grows in mud or shallow water. It has a circle of radical long-petioled leaves, ribbed ovate, and strongly resembling those of the common plantain. The scape, which is usually solitary, branches verticillately, and forms a large, open pyramidal, flowering panicle; the blossoms are very small, white or rose-colored, and have their parts in threes.

Water-power, a term used popularly and by engineers to define the apparent inherent energy of a falling body of water. It more properly signifies the application of the force of gravity employed as a motive energy for industrial purposes through the medium of water. Next to wind-power, when available in a sufficient amount, it is the ideal form of motive energy, combining a constant supply with a minimum of cost. Water acts as a motive power either by its weight, or by its *vis viva*; in the latter case the action is either one of pressure or impact, and the energy thus exerted is made available for industrial purposes by three classes of machines—water wheels, turbines, and hydraulic pressure engines. See WATER WHEELS; TURBINES; WATER MOTORS.

When the power is derived from a fall, and utilized by means of water wheels, the potential energy is the product of the height through which the water falls into the weight of that water, and may be readily computed for any fall by multiplying the volume of the flow in cubic feet per minute by 62.5 (weight of 1 cubic foot of water in pounds), and this product by the vertical height in feet. The result will be the amount of power expressed in pounds, which when divided by 33,000 will give the horse-power. When a stream acts with an impinging force upon a solid surface, the pressure exerted is equal and opposite to that by which the velocity and direction of the stream is diverted. Neglecting the factor of friction between the fluid and the surface on which it moves, the effect of the machine is equal to v^2

— wX , in which X represents the volume in cubic feet, w , the weight of water in pounds, g , grav-

WATER-POWER

ity, and v , the velocity of the flow in feet per second. When the action is that of weight and *vis viva* combined, as in the case of water flowing in a tube, the horse-power or the mechanical

effect of the motor is equal to $(h + \frac{v^2}{2g}) \times \text{mil-}$
 $\text{liplied by } 62.5.$

As a basis for indemnity under confiscation and other adjudication proceedings, the value of a water-power is commonly estimated as represented by a sum of money, the interest on which would maintain a steam plant at that place, capable of producing an equal amount of power. The best authorities, however, consider the method as erroneous, and that the value of such a power really depends upon a great number of conditions, such as location, quantity of water, height of falls, uniformity of flow, expense of dams, canals and foundations, the character of the machinery installed, and the freight charges for fuel, raw materials and finished product. Making the proper allowances for these conditions, a comparative estimate on the basis of a 500 horse-power plant, gives the gross cost of a horse-power per steam plant as about \$22,000, and that of a water-power plant as about \$19,000, representing a saving of \$30,000 per 10,000 horse-power per annum by the use of the latter. Another estimate based upon the cost of steam on large compound engines generating 1,000 or more horse-power under a boiler pressure of 120 pounds, gives a cost per annum of \$20.00 per horse-power, against \$15.00 per horse-power, developed by a water-power electric plant, established at an original cost of \$100 per horse-power, and allowing for the wages of competent attendants for the dynamos.

For renting purposes a rate unit termed "mill-power" is employed. This unit, however, is quite arbitrary, and varies in different locations, even in the same States. At Holyoke, Mass., it is declared right to draw 38 cubic feet of water per second during 16 hours in a day where the head at the fall is 20 feet, or a quantity proportionate to the height at the falls, equal to 86 horse-power, as a maximum, while at Lawrence, Mass., it is right to draw during 16 hours in a day a quantity of water sufficient to give a power equal to that of 30 cubic feet per second with a head of 25 feet, equal to a maximum of 85 horse-power.

The natural sources of water-power are rivers and streams, but as the gradient or fall of a river is seldom more than sufficient to overcome the friction due to the gradual descent of its waters, the kinetic energy or energy of motion is made available for practical purposes by the employment of dams, canals and aqueducts. The use of dams may be illustrated by assuming the gradient of a stream to be 2 feet to 100 feet. By building a dam 12 feet high across the stream, the gradual slope of 12 feet over a distance of 600 feet is converted into a vertical interval of 12 feet, and the kinetic energy of the stream expended in friction over the gradual descent of 600 feet is accumulated at the top of the dam in the form of head or pressure. This energy is utilized by conducting the water flowing over the dam to the motors through which it passes into the tail race and re-joins the stream. Where conditions are unfavorable for the construction of a dam a part of the stream may be directed into a reservoir

at a point beyond that at which the power is required, sufficiently distant to give the necessary fall, and then conducted by a canal or aqueduct to the motor, as in the case where the power is obtained from a natural water-fall. Occasionally, where the velocity of a stream is sufficient to give the required power, it is used directly for working the motor.

Current motors, however, to be most effective, would require the backing up of the whole volume of a stream until the actual head was equivalent to the theoretical head developed by the natural velocity of the stream, and as but a fraction of this velocity can be taken up by such a motor, its efficiency is generally very small. They may be employed to obtain power in small amounts from large streams, but are impracticable for developing large powers.

From 1822 up to the present time (1904) over 35 water-power plants of great magnitude have been established in the United States, capable of developing in the aggregate over 300,000 horse-power per minute. The individual plants developing 10,000 horse-power, or more per minute, are those at Lowell, Mass., 11,845, with a head of 35 feet; Manchester, N. H., 12,000, head 54 feet; Lawrence, Mass., 11,000, head 30 feet; Holyoke, Mass., 14,000, head 50 feet; Lewiston, Maine, 11,900, head 55 feet; Columbus, Ga., 10,000, head 26 feet; Saint Anthony's Falls, Minn., 15,500, head 50 feet; Niagara, N. Y. (Hy. Canal), established in 1861, 15,000, head 95 feet; and tunnel, established in 1892, 50,000, head 176 feet; Turner Falls, Conn., 10,000, head 35 feet; Spokane, Wash., 18,000, head 72 feet; Great Falls, Mont., 16,000, head 40 feet; Austin, Tex., 10,000, head 68 feet; Sault Ste. Marie, Ont., 10,000, head 15 feet; and Helena, Mont., 10,000, head 38 feet.

At Niagara, Sault Ste. Marie, Ogden, Mechanicsville, and Great Falls the water-power is employed to operate turbines or water-wheels which in turn drive electric dynamos, and the electrical energy thus developed is transmitted to and utilized by the neighboring cities. The power that may be thus obtained from the falls at Niagara is practically unlimited, and after the turbines are installed entails no further expense; but the enormous cost of the conductors required to transmit the electric power to distant points prevents the establishment of additional plants to develop a greater voltage for that purpose, while that produced at the present time is actually much more than the cities in the immediate vicinity are capable of utilizing, under the existing low voltage regulations. As a matter of fact, although the possibility of transforming water-power into electrical energy which was capable of being transmitted to comparatively distant points was a great impetus to the development of water-power plants of great magnitude, a fair, not to say full, utilization of the almost incalculable amount of power going to waste at Niagara and elsewhere, is possible only through the discovery of a cheaper conductor of electricity than copper.

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WATER PURIFICATION — WATER SOFTENING

Water Purification. See WATER SUPPLY; WATER-WORKS.

Water-rabbit, or Swamp-hare. See HARE.

Water-rail, a species of rail (*Rallus aquaticus*) widely distributed over Europe, Asia, and North Africa, and generally common, but, on account of its retiring habits and shyness, not often seen. It is about 11 inches long, olive brown above streaked with black, the under parts gray and the sides streaked. It frequents marshes and bogs, dives and swims well, but is a poor flyer. It is a delicious table-bird. In North America its nearest representative is the king rail (*R. elegans*). The name is applied generally to other species of aquatic rails (q.v.) in distinction from the land-rails and crakes (q.v.).

Water Rat, or Vole. See VOLE.

Water Rights. See RIVERS; RIPARIAN RIGHTS.

Water-scorpion, a bug of the family Nepidae, whose species inhabit ponds, and take their popular name from the scorpion-like form of the fore-legs, with which they seize their prey. The remaining two pairs are slender and locomotory, and the abdomen terminates in a long, slender breathing tube. Some of the species carry the eggs in a layer on the under side of the abdomen. *Belostomatidae* includes the largest species with flattened bodies and four-jointed antennae; *Nepa* is much flattened and oval, and the antennae are three-jointed and lamellate; while *Ranatra* includes species of linear form. The larvae and nymphs of the water-scorpions resemble the imagoes in general aspect, but lack the wings of the latter. In all stages they are sluggish in movements and secure their prey by hiding and stealth. These insects are very interesting in habits and structure. See FRESH-WATER INSECTS.

Water Shell. See ORDNANCE.

Water-snake, a harmless colubrine American snake (*Natrix fasciata*), closely allied to the garter-snakes (q.v.), but of aquatic habits, swimming and diving with great ease and skill, and spending its life largely in streams, ponds, and marshes. It lives largely upon fish, either alive or dead, frogs, tadpoles, newts, and aquatic insects and other small creatures. It is mottled in variable dull tints, and lively and pugnacious. Its eggs are laid in holes in stream banks and similar places. The common grass-snake (q.v.) of Europe, the only British serpent except the viper, is a near relative.

Water Softening, specifically the art of extracting from water the calcium (lime) and magnesium compounds which combine with soap and prevent the formation of lather, and thus are said to make the water hard; in general the extraction from water of any substance, lime, magnesia, acid, mud or other material which renders the water unsuitable for industrial use. Rain water contains only the soluble gases of the air, carbonic acid gas and oxygen, and such dust and dirt as it may have washed out of the air in its fall. Such water mixes readily with soap to form a slippery lather, and the water is said to be soft. If rain water runs down a clean, grassy slope to a stream, it is still nearly pure soft water. If it runs over limestone, or ground containing particles of limestone, it dissolves a

small amount, perhaps two grains per gallon or one part of limestone to 30,000 parts of water; but for practical purposes this is still called soft water. If, however, the rain water sinks into the ground to remain a long time in contact with limestone, it dissolves greater amounts, frequently 20 grains per gallon of water and sometimes more than 100 grains per gallon; and water is commonly said to be hard if it contains more than 5 grains per gallon. Deep well waters are nearly always of this nature. In the arid plains of the western part of the United States where the soil contains large quantities of common salt (chloride of sodium) and the other salts of sodium and potassium which are all readily soluble in water, the well waters are usually heavily charged not only with the salts of calcium and magnesium but also with the salts of sodium and potassium, and such water is called alkali water. The water which is found near the coal fields frequently contains sulphuric acid to the amount of 2 or 3 grains per gallon. Lakes contain the waters of many creeks and rivers and are usually soft water; but the current is slow and there is some concentration due to evaporation of the water, so that lake water contains rather more mineral matter than river water and is on the border line between soft and hard. Lake Erie water contains about 5 grains per gallon of the salts of calcium and magnesium. The oceans are the final receptacles for the waters of the rivers and lakes and are subject to continuous evaporation, so that in the course of years the mineral matter has become concentrated and ocean water contains about 2,100 grains per gallon of mineral matter, made up of calcium carbonate, 8 grains; calcium sulphate, 75 grains; magnesium sulphate, 99 grains; magnesium chloride, 230 grains; potassium sulphate, 55 grains; sodium chloride, 1,633 grains; the great amount of sodium chloride and the relative scarcity of calcium and magnesium compounds being due to reactions which have taken place in the water. Great Salt Lake in Utah and the Dead Sea in Palestine (q.v.) are small bodies of water, like oceans, without other known outlets than evaporation, and since the rivers feeding them are heavily charged with common salt, these lakes contain much more of it in proportion than the oceans. Ocean water contains about 3.5 per cent mineral matter, the Dead Sea 26 per cent, and Great Salt Lake averages about 20 per cent.

When hard waters are evaporated the mineral matter is left in a solid mass, interesting examples being found in the stalactites and stalagmites in caves, in the incrustation about the teeth in the human mouth, and in the deposit in the bottoms of tea kettles. The most serious damage produced by hard water in industrial operations is from the scale deposited in steam boilers and from the waste of soap in washing. Scale in boilers prevents the easy passage of heat from the fire to the water, and shortens the life of the boiler because of the excessive temperature to which the steel must be raised in order to force the heat through the scale to the water. The amount of extra fuel required to evaporate water in a boiler which is coated with scale varies with the thickness and character of the scale and with the rate at which the boiler is worked. When the boiler is being driven to nearly its full capacity, the amount of extra fuel required by a $\frac{1}{4}$ inch

WATER SPOUT—WATER SUPPLY

layer of scale is frequently as much as 30 per cent; but if the boiler is being worked at only half its capacity the difference may not be more than 10 per cent. Nearly all tables of such data are based on measurements of the additional amount of fuel required in a scale-covered boiler to heat the water at the same rate as in a clean boiler worked at normal capacity. It is estimated that the railroads of the United States are spending at least \$15,000,000 annually in additional fuel and boiler repairs due to the hard and muddy water used in some parts of the country. Using hard water in boilers is much more expensive than softening it, since on the average 1,000 gallons of hard water will do 50 cents worth of damage in fuel and repairs, while 1,000 gallons of hard water may almost always be softened for less than 5 cents. The value of the soap wasted by hard water is enormous, amounting to 70 cents per 1,000 gallons of water 10 grains hard when it would cost perhaps 8 cents per 1,000 gallons on the average to soften such water.

The chlorides and sulphates of calcium and magnesium are readily soluble in water, but the carbonate of lime or magnesium (marble or ordinary limestone) is soluble only in water which contains carbonic acid gas (CO_2). It is a simple matter to soften water which contains only the bi-carbonate of calcium, because it is necessary only to steal away the extra molecule of CO_2 by adding a little fresh caustic lime which has a great affinity for carbonic acid gas and combines with it to form a molecule of mono-carbonate of calcium, which is insoluble, and, like the remaining molecule of mono-carbonate, settles to the bottom as precipitate. The chemical reaction is stated thus:

Calcium	Slaked	Calcium mono-	
bi-carbonate	lime	carbonate	Water
$\text{CaCO}_3(\text{CO}_2)$	$+ \text{Ca}(\text{OH})_2$	$= 2\text{CaCO}_3$	$+ \text{H}_2\text{O}$

and thus there is precipitated to the bottom not only the original dissolved limestone but also the slaked lime which has become limestone by uniting with the molecule of carbonic acid gas which held the original limestone in solution. This discovery or invention was made in England by Dr. Clark about 1840, and no better or cheaper method has since been found for extracting carbonate of lime from water.

In the case of the sulphate of calcium no extraction in the above sense is possible, for we simply substitute sulphate of sodium for sulphate of calcium. The ordinary method of taking out sulphate or chloride of calcium is to add to the water the proper amount of sodium carbonate (soda ash or washing soda), when the sodium and calcium exchange acids as follows:

Calcium	Sodium	Calcium	Sodium
sulphate	carbonate	carbonate	sulphate
CaSO_4	$+ \text{Na}_2\text{CO}_3$	$= \text{CaCO}_3$	$+ \text{Na}_2\text{SO}_4$

The calcium carbonate settles as a precipitate while the sodium sulphate remains dissolved in the water, and, for boiler or washing purposes, is harmless in any ordinary amount. In water softening operations the treatment for the magnesium salts is practically identical with that for calcium salts. Mud in suspension is taken out of soft water by making a precipitate from two substances such as sulphate of iron and caustic soda, so that the precipitate in settling will carry down the fine particles of mud. The oil taken up by steam in engine cylinders is extracted from

the condensed water in the same way, so that the water may be used again in the boilers. For boiler purposes it is most important that the softened water should be freed from precipitate and made perfectly clear, because the presence of particles of solid matter suspended in the water is the most potent cause of boiler foaming. When the reactions take place, and the young and fine precipitates are formed, in the presence of old precipitate, an agglomerating action results which rolls the small particles together in balls so that they settle easy. This is the best method known for clarifying the water. The best machines in use for carrying out these processes are automatic in their action and require only to be supplied with chemicals and to have the settled precipitates discharged by opening a valve at the bottom of the settling tank, each once in 24 hours.

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Water Spout, a remarkable meteorological phenomenon frequently observed at sea, and exactly analogous to the whirlwinds experienced on land. It occurs when opposite winds of different temperatures meet in the upper atmosphere, whereby a great amount of vapor is condensed into a thick black cloud, to which a vortical motion is given. This vortical motion causes it to take the form of a vast funnel, which, descending near the surface of the sea, draws up the water in its vortex, which joins in its whirling motion. The whole column, which after the junction extends from the sea to the clouds, assumes a magnificent appearance, being of a light color near its axis, but dark along the sides. When acted on by the wind the column assumes a position oblique to the horizon, but in calm weather it maintains its vertical position, and is carried along the surface of the sea.

Water Supply. The several sources of water supply for cities are rivers of constant flow, lakes, natural and artificial, ponds, artificial impounding reservoirs, springs, shallow wells in the drift, and deep wells in the rock. The enormous amount of water consumed daily compels the larger cities of the world to seek their sources of supply in rivers and lakes; springs, natural reservoirs, and wells usually not yielding an amount of water sufficient to meet the daily demands. Exceptions are found in the city of Vienna, which seeks its source of water supply in the Schneeberg Mountains of the Austrian Alps; in Munich, which obtains its water from springs in the Mangfall Valley; New York, which draws its supply from large impounding reservoirs at the headquarters of the Bronx and Croton Rivers; Boston, which depends upon artificial reservoirs impounding the stream flow of the Sudbury, Cochituate and Nashua Rivers; Indianapolis, which obtains its water supply in deep wells in the limestone; Denver, which obtains its water from large impounding reservoirs in the valley of the South Platte River; and in one of the eight companies which furnish the water supply to the city of London, which draws its water from wells sunk in the London chalk formation. Excepting the Kent Works, all the remaining London water companies draw their waters from the Thames, Lea, and New rivers, with some small additions from wells and springs for the supply furnished by the East London and New

WATER SUPPLY

River Companies. London, Rotterdam, Hamburg, Bremen, Berlin, Saint Petersburg, Warsaw, abroad, Albany, Philadelphia, Washington, Cincinnati, Saint Louis, Nashville, Pittsburg, and Louisville, in the United States, are among the large cities depending upon rivers as their sources of supply. Glasgow, Liverpool, Manchester, and Zurich, abroad, and Buffalo, Cleveland, Chicago and Milwaukee of the large cities in the United States, have their sources of water supply in lakes. The lake which supplies water to Liverpool is a large artificial reservoir created in the Vyrnwy Valley in the north of Wales, distant about sixty-five miles from the city, from which the water is drawn first to filters at elevation sufficient to supply the filtered water by gravity to the city. Glasgow draws its water from Loch Katrine; Manchester from Lake Thirlmere; Zurich from the lake of that name, or from the River Limmat, the outlet of the lake, a short distance from its mouth; the American cities mentioned take their source in the system of Great Lakes. One of the most notable instances of large volumes of water from deep rock wells is in the supply to the city of Indianapolis, which obtains its water from twenty-five wells drilled into the water-bearing limestone which abounds in that section of the country. Of the twenty-five wells, twenty are 30 inches in diameter, and penetrate the drift and rock, distances ranging from 300 to 320 feet, with an average depth of 308 feet, and five are 8 inches diameter, with an average depth of 295 feet. The average thickness of the drift in the locality of the wells is about eighty feet. The gauged daily capacity of the twenty-five wells September 1898 was 18,700,000 gallons. In 1896 the yield of the system of driven wells which supplied water to Brooklyn was about 32,000,000 gallons. The principal cities abroad drawing their water from ground sources are Schalke, Dortmund, Cologne, Dresden, Bochum, Leipzig, Stockholm, and Copenhagen, with daily yields ranging from 6,000,000 to 11,430,000 gallons. The Vanne water, which is used for dietetic purposes in Paris, is obtained from springs, and to preserve it without change of quality it is conducted to the city in a closed conduit, received in distributing reservoirs, from which the light is carefully excluded, and reaches the consumer quite as pure as it was upon issuing from its mountain source. Cities have been located not according to the rules of hygiene, but according to the requirements of commerce; revenue rather than health has been the dominating factor, and upon the sanitarian has fallen the burden of rectifying the evils which have followed the total disregard in so many cases of one of the fundamental laws of health.

The various methods of supplying water to cities are embraced in the following systems: (1st) by gravity from natural lakes or impounding reservoirs at elevation sufficient to furnish domestic and frequently fire pressure; works typical of this system are found in New York, Boston, Baltimore, San Francisco, and Saint Paul; (2d) by pumping from rivers or lakes, or other sources, to reservoirs placed at elevation sufficient to supply under pressure water for domestic purposes, and often for fire protection; works typical of this system are found in the older works of Philadelphia, Pittsburg, Cleveland, Cincinnati, Saint Louis, Louisville,

Omaha, and Kansas City; (3d) by pumping from the sources mentioned under the second system to stand pipes, which fix the head upon the pumps and the distribution system, and supplying direct into the distribution mains; works typical of this system are found in Chicago, Milwaukee and Detroit; (4th) by pumping into the distribution mains without the intervention of stand pipes; works typical of this system are found in Indianapolis, Dayton, and Columbus.

Where impounding reservoirs are used at elevation sufficient to furnish a satisfactory pressure, these are invariably built with a view to carrying a volume of water which without the addition from rainfall would be sufficient to supply a city for at least six months, and naturally these basins become large sedimentation reservoirs, and the water as a rule is very satisfactory for drinking and other domestic uses. In the older works, where the water is pumped from rivers or lakes to storage and settling basins, the latter have been planned to contain several days' supply, and allow for a subsidence of the suspended matter in the water while retained in, or while passing through such basins. Where water is pumped under stand pipes, of course, no subsidence takes place, and the water is delivered to the consumer in substantially the same condition as it was taken from the source of supply. The same condition holds good for direct service works in which neither reservoirs nor stand pipes are used. Many of the smaller water-works built during the past twenty years have been carried out after the fourth system because it represents the least first cost, although less economical in operation than works which provide for pumping to reservoirs, or works pumping under stand pipes.

In the early history of impounding reservoir gravity works, and works in which the water was pumped to large reservoirs, it was thought a limited subsidence of a polluted river or lake water in such reservoirs would overcome all natural objections to the quality of the supply. It is now known that no surface water, whether gathered in streams or lakes, is fit for domestic uses excepting it be subjected to some method of purification which will eliminate the suspended matters due to sewage, and the washing of detritus from the water-sheds upon which the water is gathered. If it were possible to construct subsiding reservoirs of such capacity that the water might be retained for many days or weeks after being pumped from its source in order to secure a high percentage of subsidence of the suspended matters, this would remedy in part the objection to such water supplies taken from sources known to receive the effluents from city sewers, but the length of time required to successfully purify water in this manner is too great to admit of serious consideration of such a method of water purification for most cities, and filtration is resorted to as a means of doing in a short time what could be accomplished only in a very long time by means of sedimentation basins. Experiments with the water of the Ohio River at Cincinnati several years ago indicated that thirty days quiescent subsidence in reservoirs would reduce the bacterial content and turbidity about 97 per cent; filtration will rapidly reduce the bacterial content of polluted river and lake waters by 99 ± per cent, and almost entirely eliminate the turbidity. The reports of the performance of the filters at

WATER SUPPLY

Upper Roxborough (Philadelphia), where the water is carried for a short time in subsiding basins before it is thrown on the filters, show the remarkable change which can be made in a few hours by means of plain sand filters, and it is scarcely likely that in the future construction of works of public water supply many instances will be found where settling basins are planned to furnish more than two days' subsidence of the water before it passes to the filters for purification. The objection to any sewage polluted water is founded entirely upon the matters carried in mechanical suspension. The waters of large lakes or rivers probably never contain dissolved matters which unfit them for drinking and other domestic uses, nevertheless, few of these sources contain water which in its natural condition is fitted for drinking and other domestic requirements, and any system of purification which will remove all the suspended matter will be found capable of rendering the waters of large lakes and rivers well adapted for domestic purposes. The sole purpose of water purification is therefore to remove matters in suspension, of which the bacteria are a part, and as this can be accomplished much quicker, cheaper and better by plain sand filters than by large subsiding reservoirs, it is fair to presume that the latter will find few places in the future history of water-works engineering, excepting of course in such instances where the topography naturally suggests a gravity supply from impounding reservoirs of large capacity placed at an elevation sufficient to furnish the desired pressure in the street mains.

Consumption of Water.—One of the two most important problems in connection with public water supply at the present time is how to restrict the large and growing per capita consumption. Meters on the service pipes of consumers are thought by many to be the remedy, but while no one objects to the metering of the gas which he consumes, few outside of a small circle of water-works students favor the metering of water, the fear naturally being that with the advent of water meters the water bill will increase in size, or that the quantity of water allowed per consumer may be uncomfortably restricted. It does not follow that the use of water meters will generally increase the consumers' water bills, nor will the meter in any way limit the use of water, but a large consumption will require the payment of higher charges than for a small consumption.

Some idea of the per capita consumption of water in the larger cities of the United States can be gained from the following table:

CITIES 1900	Population supplied	Daily gallons	Per capita gallons
New York.....	2,444,000	245,700,000	100
Chicago.....	1,698,000	133,000,000	79
Philadelphia.....	1,594,000	187,188,000	117
Brooklyn.....	1,118,000	95,000,000	85
Boston.....	560,000	80,000,000	143
Cleveland.....	420,000	66,900,000	159
St. Louis.....	400,000	63,539,000	159
San Francisco.....	342,800	23,000,000	73
Cincinnati.....	325,000	30,600,000	94
Detroit.....	204,055	44,800,000	146
Milwaukee.....	300,000	24,000,000	80
New Orleans.....	287,104	13,820,000	48
Minneapolis.....	202,718	10,813,000	53
Providence.....	187,300	10,130,000	54
Indianapolis.....	169,184	13,400,000	79

Investigations in New York, 1900, by the Merchants' Association, showed meter measurements of water per capita per diem as follows: Of 25 houses where daily records for two weeks were taken in January, 18 used water at the rate of 51 gallons per capita, and 7 houses used water at the rate of 165.75 gallons per capita, or an average per capita consumption for the 25 houses of 91.36 gallons. At the same time, of 12 premises in Brooklyn 10 used water at the rate of 47 gallons per capita, and 2 used water at the rate of 121.45 gallons per capita, or an average for all consumers of 99.4 gallons per capita per diem. This consumption excludes the loss in the joints of street mains, but includes the loss from leaking fixtures. Mr. Croess estimated the per capita consumption as 116 gallons per day, which he thought by metering all domestic services could be reduced to 65,000,000 gallons per day.

The wide variation of consumption in different cities cannot always be easily accounted for. Thus in Denver the large per capita consumption can be attributed partly to the necessity of taking water from the street mains for all purposes, including irrigation of lawns, trees and shrubbery, and partly to the lack of necessity at the present time for an economical use of water, but why Cleveland, a manufacturing city, should use or waste water at three times the rate of Providence, another manufacturing city, cannot so easily be explained, excepting that in the latter city nearly all service pipes are metered, while few meters are used in the former. No individual consumer is ever ready to admit that he wastes water, and doubtless fancies that considering his actual needs, he is very careful to draw no more than the quantity required by his bare necessities. Nevertheless, aside from the leakage at the joints of street mains, which ought not to vary widely in different cities, equipped with modern cast iron pipes, there is a difference in the per capita consumption which can only be accounted for by differences in the habits of the consumers.

Mr. Dexter Brackett, in a paper to the American Society of Civil Engineers, 1895, from investigations in and around Boston, showed that the per capita consumption ranged from 6.6 gallons in small domiciles with a single faucet to 46 gallons in first class apartment houses. From the same source the interesting fact is obtained that for 12 of the larger cities of the United States, the consumption of water per capita has rapidly risen during the twenty years prior to 1894, thus:

CONSUMPTION — GALLONS, PER CAPITA, PER DIEM.

CITY	1874	1875	1877	1893	1894	Per cent increase
Boston, Cachituate.....	72	..	..	..	101	40
Boston, Mystic.....	72	..	..	..	89	23
Chicago.....	72	..	..	147	..	105
Philadelphia.....	68	..	..	110	..	62
Brooklyn.....	54	..	..	86	..	59
St. Louis.....	55	..	..	95	..	73
Cincinnati.....	55	..	..	100	..	82
Cleveland.....	45	..	..	130	..	190
Detroit.....	47	..	..	..	104	48
Milwaukee.....	..	29	..	108	..	272
Louisville.....	40	..	..	75	..	87
Providence.....	..	..	24	63	..	166
Fall River.....	18	..	..	27	..	50

WATER SUPPLY

In considering the consumption of water per capita per diem, some thought should be given to the unavoidable losses by leakage of reservoirs, pipe distribution systems, service pipes, and domestic plumbing. It is customary to charge the whole pumpage, or draft from impounding reservoirs or other gravity sources to consumption, while as a matter of fact, with few exceptions, about one half the so-called consumption is lost through leakage of reservoirs, pipe systems, and plumbing fixtures, and of the remaining one half, supposed to be used, some waste might also be recorded. The information with reference to leakage of reservoirs is rather meagre, but it is well known that no reservoir is entirely watertight, and so long as the loss is not calculated to imperil the stability of dams, embankments, and like structures, nor create a costly or unallowable deficiency in the water supply, but little attention is paid to such losses.

Some data on the daily and percentage loss of water in concrete tanks, backed by well prepared clay puddle, from the new Philadelphia water-works (1903) is given in the following table:

LEAKAGE OF BELMONT FILTER TANKS.

Area (one filter) 31,800 square feet, depth of water 9 feet. Percentage leakage based on a daily flow of 4,380,000 gallons of water through each filter tank.

FILTER *	Leakage in 24 hours	Percentage loss
1.....	970	0.0221
3.....	727	0.0166
4.....	970	0.0221
5.....	610	0.0140
6.....	243	0.0055
8.....	566	0.0129
9.....	728	0.0166
10.....	776	0.0177
11.....	582	0.0135
12.....	475	0.0108
17.....	849	0.0194
18.....	849	0.0194

LEAKAGE OF TORRESDALE FILTERS.

Area (one filter) 32,670 square feet, depth of water 9 feet. Percentage leakage based on a daily flow of 4,500,000 gallons of water through each filter tank.

FILTER No. *	Leakage in 24 hours	Percentage loss
1.....	244	0.0054
2.....	244	0.0054
3.....	0	0
4.....	0	0
5.....	488	0.0108
6.....	244	0.0054
7.....	244	0.0054
8.....	732	0.0162
9.....	0	0
10.....	243	0.0054
11.....	244	0.0054
12.....	488	0.0108
13.....	488	0.0108
14.....	488	0.0108
15.....	488	0.0108
17.....	244	0.0054
19.....	488	0.0108
20.....	488	0.0108
22.....	732	0.0162
23.....	732	0.0162
24.....	488	0.0108
25.....	732	0.0162
26.....	488	0.0108
27.....	976	0.0216
28.....	732	0.0162
29.....	732	0.0162
30.....	0	0
31.....	244	0.0054
32.....	244	0.0054
33.....	488	0.0108
35.....	732	0.0162

37.....	244	0.0054
38.....	732	0.0162
39.....	244	0.0054
50.....	488	0.0108
51.....	732	0.0162
53.....	488	0.0108
54.....	244	0.0054

* Filters tested to date.

LEAKAGE OF LOWER ROXBOROUGH FILTERS.

Area (one filter) 23,087 square feet, depth of water 9 feet.

Percentage loss of filters based on a daily flow of 3,180,000 gallons of water through each filter, and of 12,000,000 gallons per day through the clear water basin:

FILTER	Leakage in 24 hours	Percentage loss
1.....	885	0.0278
2.....	3,097	0.0974
3.....	1,770	0.0557
4.....	4,435	0.1391
5.....	1,770	0.0557
Clear water basin.....	1,075	0.00896

LEAKAGE OF UPPER ROXBOROUGH FILTERS.

Area (one filter) 30,928 square feet, depth of water 9 feet.

Percentage loss of filters, based on a daily flow of 3,195,000 gallons through each filter, and of 20,000,000 gallons per day through the clear water basin:

FILTER	Leakage in 24 hours	Percentage loss
1.....	0	0
2.....	0	0
3.....	690	0.0216
4.....	0	0
5.....	1,150	0.0360
6.....	460	0.0144
7.....	1,840	0.0576
8.....	1,150	0.0360
Clear water basin.....	3,300	0.00165

Each of these structures was under test for leakage from two to four weeks, the losses of level being taken by hook gauges reading to .001 foot, and corrections made for gain by rainfall, or loss by evaporation.

Leakage of Water Mains.—Like the leakage of tanks and reservoirs, information on the actual leakage of large pipe systems is not nearly as full as it should be, and the lack of it often leads to unpleasant discussions with contractors upon the reasonable allowable leakage of pipe systems when completed and offered for acceptance and use. It is convenient to state the leakage in gallons per day of 24 hours, per mile of pipe without regard to the various sizes embraced in the system. It is obvious that a mile of 48-inch cast-iron pipe should show and be allowed a greater leakage than a mile of 12-inch pipe, and it would be much fairer and more accurate to state the leakage in gallons per 1,000 (or other measure) linear feet of lead pipe joint, because the leakage whatever it may reach in gallons per day is almost exclusively at the joints. According to Mr. James R. Croess, in his report to the Merchants' Association, on the 'Waste and Consumption of Water in New York City, 1900,' the leakage of the pipe distribution system of that city is as high as 142,000 gallons per mile per day of 24 hours, and of Brooklyn, 60,000 gallons per mile per day; of Boston, 14,187 gallons per mile per day. The leakage of the pipe system of Fall River, where 94 per cent of all the water services are metered, is estimated as 24.40 per cent of the whole consumption; at Boston the leakage is estimated as 27.30 per cent of the whole consumption.

Carefully conducted tests for leakage of the several systems of pipe connected with the Bel-

WATER SUPPLY

mont Filters, Philadelphia, furnished the following information:

Main supply pipe, consisting of 1,900 feet of 48-inch pipe, 280 feet of 42-inch pipe, 670 feet of 36-inch pipe, 190 feet of 30-inch pipe, 360 feet of 24-inch pipe, and 340 feet of 20-inch pipe, total 3,740 feet, or 0.7083 mile, under a pressure of 50 pounds per square inch lost water at the rate of 4,030 gallons per day, corresponding to a leakage of 5,690 gallons per mile. Main effluent pipe, consisting of 2,610 feet of 48-inch pipe, 140 feet of 42-inch pipe, 120 feet of 36-inch pipe, 430 feet of 30-inch pipe, 470 feet of 24-inch pipe, and 730 feet of 20-inch pipe, total 4,500 feet, or 0.852 mile, under a pressure of 50 pounds per square inch lost water at the rate of 8,640 gallons per day of 24 hours, corresponding to a leakage of 10,140 gallons per mile. The raw water drain pipe consisting of 1,820 feet of 24-inch pipe and 840 feet of 20-inch pipe, total 2,660 feet, or 0.504 mile, under a pressure of 50 pounds per square inch, lost water at the rate of 5,040 gallons per day of 24 hours, corresponding to a leakage of 10,000 gallons per mile. The effluent drain pipe, consisting of 1,440 feet of 24-inch pipe, 570 feet of 20-inch pipe, and 440 feet of 18-inch pipe, total 2,450 feet, or 0.464 mile, under 50 pounds pressure per square inch, lost water at the rate of 2,448 gallons per day of 24 hours, corresponding to a leakage of 5,276 gallons per mile. The refill pipe, consisting of 1,670 feet of 20-inch pipe, and 760 feet of 16-inch pipe, total 2,430 feet, or 0.46 mile, under a pressure of 100 pounds per square inch, lost water at the rate of 6,480 gallons per day of 24 hours, corresponding to a leakage of 14,087 gallons per mile. The pressure pipe which supplies water under 80 pounds pressure per square inch to the sand ejectors and washers, consisting of 460 feet of 20-inch pipe, 750 feet of 16-inch pipe, 170 feet of 12-inch pipe, 360 feet of 8-inch pipe, 640 feet of 6-inch pipe, and 450 feet of 4-inch pipe, total 2,830 feet, or 0.536 mile, under a pressure of 100 pounds per square inch, lost water at the rate of 2,500 gallons per day of 24 hours, corresponding to a leakage of 4,664 gallons per mile. The average diameter per mile of each of these lines or systems of pipes is larger than that of cast-iron pipe in a city pipe distribution system.

Considering the percentage loss based on the daily flow of water through the pipes, the losses were as follows:

Line or Pipe	Percentage loss
Main supply	0.0101
Main effluent	0.0016
Raw water drain	0.1008
Pressure	0.0203

Filtration.—No single aspect of public water supply is to-day of more importance than the quality of the water supplied from day to day. Upon the quality of the water may rest the health and commercial welfare of a community. Many cities have been temporarily injured by the known bad quality of their water supply, and many distressful and costly epidemics of typhoid fever may be properly attributed to the temporary use of a sewage polluted water. The remedy for this condition may be found in changing the source of supply, when this is possible, but for some cities the only alternative is the adoption of some method of water

purification which will eliminate the germs of disease from the water. The only practical method of purification thus far adopted by cities is filtration, of which several systems have been tried, but only one of which, that is, plain sand filtration, has successfully withstood the test of time. The filtration of water for public use was first installed by Mr. James Simpson at the Chelsea Waterworks, London, 1838. Parliament in 1852 passed an act requiring all the so-called river works of London to filter their water before it was delivered to the consumers.

No substantial difference exists between the original plain sand filter proposed by Mr. Simpson in 1838 and the modern plain sand filter which is being carried out at the present time (1904) on a grand scale for the city of Philadelphia. In each case the filter consists of a masonry tank in the bottom of which are placed pipes to conduct away the filtered water; above and around the pipes is spread coarse gravel ranging in material as large as one's fist to coarse sand, upon which is placed a bed of so-called filter sand, with suitable arrangements in the matter of pipes and valves to control the rate of inflow of unfiltered water to the filter, and of filtered water from the filter to the clear water basin. However, the subsequent extended use of plain sand filters in several of the larger cities of Europe, notably Saint Petersburg, Warsaw, Dantzig, Berlin, Bremen, Hamburg, the works of London, Edinburgh, Liverpool, and other cities of the United Kingdom, has had the effect of largely improving the mechanism required for the proper control of such filters. It is altogether probable that the first filter built by Mr. Simpson at the Chelsea Works, London, may have given as satisfactory effluents as any built subsequently, but the lack of convenient and proper analytical tests at the date mentioned makes it impossible at the present time to show what changes were effected by Mr. Simpson's very simple yet very wonderful adjunct of water-works which are compelled to draw their supplies from sources of known or suspected sewage pollution.

The real merits of the plain sand filter were never understood until after the improvements in bacteriology, made by Dr. Robert Koch, became a part of water analysis, in fact all the refinements for the technical investigation of water supplies have been developed, and many of them perfected, within the last 20 years. If the means of technical water investigation had been as good 60 years ago as they are to-day, and the same interest felt by communities in the character of their public water supplies, filters would to-day be as much a part of municipal water-works (where the water is drawn from streams, lakes, and ponds which receive sewage effluents) as is the pumping machinery, storage, and settling reservoirs, stand-pipes, and the cast-iron or other mains which convey the water to the consumer. Pumps, pipes, and reservoirs are regarded as essentials of water-works, and the proposition to incorporate each or all in any system of works excites only ordinary business interest, and involves only two simple considerations: first, the capacity of such details; and second, the cost of construction, operation, and maintenance, while filters at the present time are still regarded, if not as unproven details of water-works con-

WATER SUPPLY

struction, certainly as details, the efficiency of which is still a matter of doubt; and this condition may be ascribed very largely to the lack of facilities for the technical investigation of water going to and coming from the older filters in the cities of Europe, rather than to any lack of efficiency in the performance of the filters. When Mr. James P. Kirkwood, the father of water-works engineering in the United States and one of the most distinguished members of the profession, visited Europe in behalf of the city of Saint Louis, to examine and report on the filters at that time in operation in London, Berlin, and other cities abroad, it is probable that the filters generally were performing as well then as they are now. Perhaps their work from day to day was not as regular as it is now because the means and facilities for measuring the work and controlling the operation of the filter were not at that time so well established as they are now. Substantially the only real attempt to improve the art of filtration of public water supplies since the publication of Mr. Kirkwood's classic report on the filtration of river water, and indeed since the introduction of the plain sand filter at the Chelsea Works in 1838, has been to reduce the cost of constructing and operating the filters, to materially increase the rate of percolation, or to maintain a constant high standard of efficiency without regard to the quality of the applied water. The only obstacle to the broad introduction of plain sand filters with suitable adjuncts for the purification of a sewage polluted public water supply, is the lack of confidence in the practical results to be obtained, and when this confidence is established, as it will be in due time, it will then be a matter of wonder why so many of the large cities of the United States like Boston, New York, Philadelphia, Baltimore, Cleveland, Cincinnati, Saint Louis, and Chicago have been willing to continue the use of polluted public water supplies for so long a time, when the remedy was to be found in engineering structures, simple of construction and operation, and as certain in the performance of their work as the highest class of pumping engine used to lift water from lakes and rivers to settling and storage basins, or to pump it under stand-pipes into the distribution mains. It is a fact not often recognized that in any large city upward of 90 per cent of the population, where the source of water supply is from the public mains, are wholly dependent upon the city, not only for the quantity but for the quality of their water for all purposes. Nine tenths of the people are unable, or unwilling, to adopt domestic appliances for the purification of polluted water, and unless the municipality undertakes to supply a satisfactory water, fully this proportion of the population, by force of circumstances or indifference, will continue to use such water as may come to them through the street mains, and any steps which a city may take to broadly improve the quality of its water supply may properly be regarded as an effort to improve the health of at least nine tenths of its population. The wealthier residents of any city may easily overcome the objections to a polluted water supply, so far as it affects their own homes only, by the introduction of domestic filters, many of which, if properly attended to, can be relied upon to fur-

nish satisfactory drinking and culinary water, but this is only a partial safeguard even to the users of the water, because it will guarantee satisfactory water only in their own homes, and when they leave their homes for places of business or pleasure they may be compelled to use the polluted water, and the effect of their individual efforts to improve the quality of the water in their respective homes will be partially lost. The influence on health of a bad water supply for a large city is not limited to the city, but will have a far-reaching effect on cities many miles distant by reason of the intercourse between the larger and the smaller cities. It is thus possible for the polluted water supply of a large city to partially defeat the effect of a very perfect supply in some of the smaller cities surrounding it, visitors from the smaller to the larger city drinking the polluted water, and carrying away the germs of typhoid fever, and other water-borne diseases.

As matter of interest in connection with the filtration of large volumes of water daily for city use, the following technical results from the operation of the Upper Roxborough filters, Philadelphia, are offered. These filters were first put in service during July 1903, and the results show how well they were performing within one month of starting. The daily capacity is 20,000,000 gallons.

Turbidity is stated in parts per million by the silica standard. The bacterial content of the water is stated in colonies per cubic centimetre of water sample:

OPERATION OF UPPER ROXBOROUGH FILTERS.

Week ending 1903		Bacteria per c.c.	Turbidity per million by silica std.
Sept. 19,	Schuylkill River at Shawmont.....	18,000	21
	Applied water.....	750	11
	Filter No. 1.....	26	0 +
	" " 2.....	190	0 +
	" " 3.....	14	0 +
	" " 4.....	29	1
	" " 5.....	99	1
	" " 6.....	21	0 +
	" " 7.....	6	1
	" " 8.....	19	0 +
	Clear water basin.....	43	1
Sept. 26,	Schuylkill River at Shawmont.....	26,000	24
	Applied water.....	780	11
	Filter No. 1.....	55	0 +
	" " 2.....	17	0 +
	" " 3.....	29	0 +
	" " 4.....	24	0 +
	" " 5.....	7	0 +
	" " 6.....	6	0 +
	" " 7.....	9	1
	" " 8.....	23	0 +
	Clear water basin.....	24	0 +
Oct. 3,	Schuylkill River at Shawmont.....	43,000	12
	Applied water.....	1,200	7
	Filter No. 1.....	10	0 +
	" " 2.....	9	0 +
	" " 3.....	14	0
	" " 4.....	170	0 +
	" " 5.....	6	0 +
	" " 6.....	7	0 +
	" " 7.....	7	1
	" " 8.....	23	0 +
	Clear water basin.....	15	0 +
Oct. 10,	Schuylkill River at Shawmont.....	37,000	100
	Applied water.....	2,500	8
	Filter No. 1.....	11	0 +
	" " 2.....	7	0 +
	" " 3.....	99	0 +
	" " 4.....	35	0 +
	" " 5.....	7	0 +
	" " 6.....	10	0
	" " 7.....	6	0.5
	" " 8.....	18	0 +
	Clear water basin.....	21	0.5

WATER SUPPLY

Oct. 17,	Schuylkill River at Shawmont..	17,000	38
	Applied water.....	3,100	28
	Filter No. 1.....	33	0 +
	" " 2.....	18	0.5
	" " 3.....	38	0.5
	" " 4.....	36	0.5
	" " 5.....	10	0.5
	" " 6.....	11	0.5
	" " 7.....	7	0.5
	" " 8.....	24	0 +
	Clear water basin.....	23	0.5
Oct. 24,	Schuylkill River at Shawmont..	9,800	13
	Applied water.....	600	14
	Filter No. 1.....	30	0 +
	" " 2.....	8	0 +
	" " 3.....	7	0 +
	" " 4.....	8	0.5
	" " 5.....	6	0.5
	" " 6.....	10	0.5
	" " 7.....	46	0.5
	" " 8.....	14	0 +
	Clear water basin.....	12	0.5
Oct. 31,	Schuylkill River at Shawmont..	4,300	11
	Applied water.....	590	9
	Filter No. 1.....	15	0 +
	" " 2.....	7	0 +
	" " 3.....	4	0 +
	" " 4.....	5	0 +
	" " 5.....	22	0.5
	" " 6.....	7	0 +
	" " 7.....	8	0.5
	" " 8.....	14	0 +
	Clear water basin.....	12	0 +
Nov. 7,	Schuylkill River at Shawmont..	8,800	7
	Applied water.....	310	6
	Filter No. 1.....	6	0 +
	" " 2.....	20	0 +
	" " 3.....	3	0 +
	" " 4.....	5	0 +
	" " 5.....	5	0.5
	" " 6.....	6	0 +
	" " 7.....	3	0.5
	" " 8.....	12	0 +
	Clear water basin.....	8	0 +
Nov. 14,	Schuylkill River at Shawmont..	8,300	8
	Applied water.....	450	8
	Filter No. 1.....	3	0 +
	" " 2.....	7	0 +
	" " 3.....	3	0 +
	" " 4.....	3	0 +
	" " 5.....	3	0 +
	" " 6.....	4	0 +
	" " 7.....	3	0 +
	" " 8.....	4	0 +
	Clear water basin.....	5	0 +
Nov. 21,	Schuylkill River at Shawmont..	26,000	10
	Applied water.....	1,800	7
	Filter No. 1.....	2	0 +
	" " 2.....	3	0 +
	" " 3.....	3	0 +
	" " 4.....	7	0 +
	" " 5.....	3	0 +
	" " 6.....	31	0 +
	" " 7.....	7	0 +
	" " 8.....	3	0 +
	Clear water basin.....	6	0 +

Belmont Filtration Works.—The Belmont Filtration Works will supply that part of Philadelphia which lies west of the Schuylkill River, consisting at present of a population estimated at 170,000, growing at the rate of 3.64 per cent per annum, and which, it is assumed, will have a population in 1950 of 550,000 in round numbers. The water supply is pumped from the Schuylkill River at the present Belmont Station, located on the west bank of the Schuylkill River about in the centre of the west division of Fairmount Park.

The works consist of two subsiding basins, executed partly in excavation and partly in embankment, having a total depth from the top of the embankment to the floor of the reservoir of 29 feet, and an available water depth of 25 feet. The reservoir consists of two divisions, known as the East and West Divisions, which contain a flow line of about 36,000,000 gallons, representing at the present time about 24 days' sedimentation of the water before it is drawn from the basins to the preliminary filters. Each basin has an inside and outside

slope of two horizontal to one vertical, the interior of the floor and the slope being first covered with a heavy layer of clay puddle rolled in place, over which is placed a five-inch thickness of concrete paving as a monolith, upon which up to within 10 feet of the high water line is placed a layer of asphalt $\frac{5}{8}$ -inch thick. The clay puddle consisted of 50 per cent of mixed clay and 50 per cent of clean stone ballast, tempered in an ordinary pug mill, and placed and rolled on the floor in two separate layers. Upon the slopes the puddle was rolled in layers six inches thick in excess of the actual requirements, and the surplus trimmed off to true slope lines.

From the sedimentation reservoir the subsided water is conveyed to a system of 20 preliminary filters, consisting of concrete tanks 60 feet long, 20 feet wide, and 8 feet deep, in which are placed materials very much like that in the plain sand filters excepting that the sand is more uniform of grain and coarser; the underdrain material at the bottom is likewise made up of coarser material and placed 12 inches deep, with suitable pipes to conduct the subsided water to the filters, and to conduct the pre-filtered water to the plain sand filters, and a system of wash pipes by means of which the bed of sand lying above the underdrain material is washed in place from time to time as may be required. The purpose of the preliminary filters at Belmont, and at the other works forming part of the improvement of the water supply of Philadelphia, is three-fold: first, to enable the plain sand filters to operate at a higher rate than has heretofore been employed, and correspondingly reduce the acreage of plain sand filter surface required to treat the subsided water; second, to prolong the life and increase the yield of the plain sand filters between scrapings from 60,000,000 or 70,000,000 gallons per acre, to from 90,000,000 to 150,000,000 gallons per acre; third, to obtain a more regular and better effluent than is possible with the plain sand filter when supplied only with water which has been undergoing subsidence for a few days. The preliminary filters are intended to perform in a short time what could be accomplished only in a very long time by simple sedimentation.

The plain sand filters at Belmont consist of 18 covered concrete tanks, arranged in groups of six each, having dimensions varying from 196 to 272 feet in length, and from 120 to 165 feet in width, giving a net area of filter at the sand line of 0.735 acre. The floors of the filters consist of concrete inverted arches 15 feet 3 inches square, with a depth of arch at centre of eight inches, a thickness of six inches at the centre, and of 14 inches under the piers. The roof arches have the same span as the floor inverts, a rise at the centre of 36 inches, a thickness at the crown of 6 inches, and of 15 inches at the spring line normal to the soffit. The roof arches are carried on monolithic concrete piers, 9 feet 1 inch high, 30 inches square at the base, and 22 inches square at and above the sand line, giving a total height from the centre of the invert under the floor to the centre of the roof arch of 12 feet 9 inches. Against the side and end walls of the filters a layer of concrete (mixed and placed as in the sedimentation reservoir) is rolled or rammed in place to render the filters watertight. The end

WATER SUPPLY

walls of all filters, and the side walls of the end filters, are designed as abutments to transmit the arch thrust to the foundation. In the roof of each filter is placed a system of ventilators which can be opened in the summer time to ventilate the filter when the sand bed is being cleaned, and the filter being prepared for another run, but in winter time these ventilators are closed in order to avoid freezing of the sand at any time when it is laid dry for the purpose of scraping. Above the concrete arched roof of the filter is placed a thickness of 36 inches of earth rolled in place, finished with top soil and seeded, in order that in due time the upper surface of the filter, as well as the slopes, will be covered with a neat turf, partly for protection of the materials in the earth fill over and around the filters, and partly to improve the appearance of the work. Each filter is provided with automatic regulators, one on the influent pipe to maintain a constant level of water over the sand bed, and the other on the effluent pipe to maintain a constant rate of operation of the filter, and incidentally to measure its rate and amount of work. The regulators are controlled by large copper floats which rise and fall with changes in the level of the water. In the effluent chamber the regulator consists of a telescoping weir which gradually descends in its guiding pipe until the depth of water in this chamber represents the maximum loss of head under which it is desired to work the filter. The relation of the lip of the weir to the copper float from which it depends is adjustable in order to vary the rate of percolation through the filter, thus when first put in service the rate of operation may be 1,000,000 gallons per acre per day of 24 hours, and in the course of two or three days the rate is increased to 6,000,000 gallons per acre per day, by the adjustment of the relation of the lip of the weir to the surface of the water in the effluent chamber. The telescoping tube slides through an annular cup leather packing, which maintains a watertight joint between the tube and the barrel into which it slides. In the centre of each filter at the bottom is placed a main collector with which are connected at intervals of 15 feet 3 inches the lateral collectors that reach from the main collector nearly to the side walls of the filter tank. The main collector is a watertight channel, constructed of concrete, and the lateral collectors are made of eight-inch and six-inch vitrified terra cotta pipes, perforated for their entire circumference from end to end. Around the main and lateral collectors to a depth of 16 inches above the lowest point in the floor of the filter is placed the underdrain material consisting of five sizes of gravel, ranging from three inches in diameter to material that will pass a No. 14 sieve and be intercepted on a No. 20 sieve, arranged in successive layers of six inches, four inches, three inches, and one inch, the smaller material, of course, being placed at the top in the one inch layer.

In placing the underdrain material in the filter, three different plans have been followed; one in which the material is placed horizontally from wall to wall of the filter impinging against the intermediate piers; another in which the underdrain material impinges against the piers but is kept a distance of 24 inches from the side walls, and still another, which is

regarded as the ideal arrangement, in which the underdrain material is kept 20 inches from the piers and 24 inches from the end and side walls. In the latter plan it is impossible for water to flow down between the masonry of the piers or walls of the tank, and pass into the underdrains without percolating horizontally through at least 20 inches of sand.

The sand in the filters consists of either river or bank sand, properly freed from clay, dirt, and organic matter, ranging in size from grains which will pass a sieve having six meshes to the linear inch, to grains which will not readily pass a sieve having 80 meshes to the linear inch. The sand is placed to a depth varying from 28 to 42 inches over the underdrain material, and constitutes the true filtering material. When the surface of the sand bed becomes clogged with the suspended matter removed from the water, and the maximum loss of head is reached, the filter is taken temporarily out of service, and the layer of sand at the surface is carefully scraped off for a depth of from one half to one inch, and heaped in little piles in the several bays of the filter. After the filter has been scraped the sand is thrown out by an ejector, worked by a current of water under pressure of from 60 to 80 pounds per square inch, to the sand washers in the courts in front of the filters, where, after it is washed, the sand is stored until such time as it becomes desirable by successive parings of the sand bed to renew the full depth of sand in the filter.

From the filters the water is conveyed through cast-iron pipes 48 inches in diameter, to a clear water basin constructed with concrete inverted arches under the floor, square plumb piers, and concrete arches of the same dimensions, and in the same manner as the filters, excepting that the total height from the centre of the floor invert of the clear water basin to the crown of the arch at the soffit is 18 feet, which provides for a water depth of 15 feet. From the clear water basin the filtered water is conveyed through cast-iron pipes into the distribution system.

The Belmont filters are intended to operate at the rate of 6,000,000 gallons per acre per day, giving a capacity for each filter in service of 4,410,000 gallons, corresponding to a rate of percolation through the sand bed of 19 feet per day of 24 hours, or of nine inches per hour. The daily capacity of the Belmont station (18 filters), allowing 15 per cent reserve for scraping, washing, and renewal of sand, and such other operations as may require filters from time to time to be temporarily out of service, is 65,000,000 gallons, although for the first two years they will be operated not in excess of the capacity of the preliminary filters, namely, 40,000,000 gallons per day. By the addition of 25,000,000 gallons preliminary filter capacity this station will be raised to 65,000,000 gallons per day, which is thought to be sufficient to meet the requirements of that portion of the city lying west of the Schuylkill River for a period of 25 or 26 years, after which time, not only will the preliminary filter capacity be raised, but additional filters will be built on land reserved for the purpose south of the present installation.

Population and Pipe Mileage.—The most expensive waterworks to build and maintain,

WATER SUPPLY

other things being equal, will be that in which the population per mile of pipe distribution system is the least. The city of Denver contains one mile of distribution pipe for every 304 of the population. At one time this city was supplied by two rival companies, and in many miles of streets the distribution mains are duplicated. Prior to the consolidation of the Denver Union Water Company and the Citizens' Water Company over 70 miles of the former company's mains had been paralleled by its rival, and the competition at one time was so strong that one or both companies actually furnished water to their consumers without charge; eventually the two companies combined in the Denver Union Water Company, and the consolidation then owned the mains of the two former companies. This fact, in part, accounts for the excessive mileage of pipe relative to population in that city. The influence of a dense population in Greater New York is shown in the very large population per mile of water pipe, which is nearly two and one half times that of Philadelphia and Saint Louis, and three times that of Boston. Omitting the cities of New Orleans and Nashville, in which, by reason of the large percentage of colored population, the mileage of pipe is small compared with population, New York, in which the population per square mile of territory is very large, and Denver, where the condition of pipe mileage is abnormal compared with population, it

will be seen that in all the other cities the relation of population and mileage of distribution pipe is fair, the population per mile of pipe increasing generally with the size of the city.

MILEAGE OF WATER PIPES OF VARIOUS CITIES AND THE POPULATION SUPPLIED.—1900.

City	Total mileage of water pipes	Total population	Population per mile of pipe
New York	1,539	3,437,274	2,233
New Orleans	125	300,000	2,400
Nashville	86	110,000	1,280
Chicago	1,871	1,698,575	908
Philadelphia	1,300	1,293,696	980
Saint Louis	616	575,238	934
Boston	706	560,892	794
Cleveland	549	381,768	695
Detroit	617	375,000	608
Buffalo	500	352,819	704
Washington, D. C.	370	289,000	781
Milwaukee	338	285,315	844
Pittsburgh	323	236,761	733
Minneapolis	266	202,718	762
Providence	326	187,297	574
Indianapolis	208	169,000	812
Denver	446	133,859	304
Toledo	170	131,822	775
Albany	132	100,000	758
Richmond	94	85,050	905

Compound and Triple Expansion Pumping Engines.—The large increase in the demands for water by all the larger cities of the country during the past 20 years has stimulated manufacturers of large high duty pumping machinery

TRIPLE EXPANSION PUMPING ENGINES.

Built by the Holly Manufacturing Company, Lockport, N. Y.

LOCATION	Steam cyl. Diam. in inches	Plungers Diameters Inches	Stroke Inches	Rev. per minute	H. P. Indicated	Head Feet	Capacity M. G. D.	Duty M. F. P.	Remarks
Boston	17-31½-48	37	60	30	150	45	35	158½	Per 1,000 lbs. steam
Boston	22-41½-62	36½	60	25	150	125	20	172½	Per 1,000 lbs. steam
Cleveland	30-36½-84	22½	48	28½	150	404	10	168½	Per 1,000 lbs. steam
Cleveland	32-60-90	36	60	22½	150	189	25	140	Per 1,000,000 B. T. U.
Philadelphia	32-60-90	33	66	20	160	255	20	130	Per 100 lbs. coal.
Cincinnati	32-60-90	38½	60	20	160	184	25	135	Per 100 lbs. coal.
Cincinnati	34-64-96	26½	60	20	160	460	12	135	Per 100 lbs. coal.
Louisville	30-36½-84	33½	60	25	160	200	24	170	Per 1,000 lbs. steam
Minneapolis	30-36½-84	29½	60	21	160	234	13	168	Per 1,000 lbs. steam

Built by the Edward P. Allis Company, Milwaukee, Wis.

LOCATION	Steam cyl. Diam. in inches	Plungers Diameters Inches	Stroke Inches	Rev. per minute	H. P. Indicated	Head Feet	Capacity M. G. D.	Duty M. F. P.	Remarks
Boston	21-38-58	48½	60	25	150	40	50	150	.....
Boston	30-56-87	42	66	18	185	140	30	178	50-100 Per 1,000 lbs. steam
Cleveland	34-62-92	34	64	18½	150	196	20	161	69-100 Per 1,000 lbs. steam
Toronto	32-60-90	32½	60	20	148	231	18	165	.....
Reading	30-56-84	28½	60	22½	150	277	15	150	.....
Omaha	40-70-104	32½	66	20	105	312	20	140	.....
Detroit	34-62-92	26½	72	18	135	185	25	142	37-100 Per 1,000 lbs. steam
Washington	20-36-56	24½	42	28½	150	81	20	150	.....
St. Louis	34-62-92	29½	72	16 7-10	135	289	13	178	61-100 Per 1,000 lbs. steam
St. Louis	34-62-94	33½	72	16 7-10	140	231	20	175	.....
Chicago	15-29-46	24½	48	62	150	135	25	162	Reidier gear for pump valves

Built by the I. P. Morris Company, Philadelphia, Pa.

LOCATION	Steam cyl. Diam. in inches	Plungers Diameters Inches	Stroke Inches	Rev. per minute	H. P. Indicated	Head Feet	Capacity M. G. D.	Duty M. F. P.	Remarks
Boston	18½-33-52½	60	120	18	.....	.....	72	.....	Sewage pump.....
Calumet and Hecla	18-27½-48	34-48	90	22½	.....	35	60	.....	.....

TWO CYLINDER COMPOUND PUMPING ENGINES.

Built by the I. P. Morris Company, Philadelphia, Pa.

LOCATION	Steam cyl. Diam. in inches	Plungers Diameters Inches	Stroke Inches	Rev. per minute	H. P. Indicated	Head Feet	Capacity M. G. D.	Duty M. F. P.	Remarks
Lawrence	18-38-26½	64	16	.....	.....	5	111 55-100	.....	Per 100 lbs. coal.
Lynn	17½-36-26½	84	18	.....	.....	5	102 15-100	.....	Per 100 lbs. coal.
Louisville	27½-54½	24 1-16-34	84	18 57-100	140	193½	17 68-100	.....	Per 1,000 lbs. dry steam
Boston .....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Calumet and Hecla	17½-36	20-28 5-16	60	34	.....	35	16	.....	.....
Calumet and Hecla	11½-24	16½-23	54	38	.....	35	10	.....	.....

WATER SUPPLY

to unusual efforts in the attempt to reach an engine economy not attained by any other type of steam-engine. Higher steam pressures, higher piston speeds, higher expansions, and improved shop work have enabled the builders to obtain duties to-day which 20 years ago were thought by many to be unattainable with steam-engines. As a rule the more modern engines are being built in larger units, partly to diminish the cost for a given daily pumping capacity and partly by reason of the improved materials, design, and shop work entering into the construction of these machines which largely diminishes the probability of serious derangement or accidents in service. In the preceding tables all the engines noted are of the crank and fly-wheel type, all have steam jacketed cylinders, and with the exception of some of the pumping engines built by the I. P. Morris Company, all are constructed with single acting plunger pumps. The present cost (1904) for triple expansion crank and fly-wheel pumping engines per million gallons of capacity against 100 feet pumping head is about \$2,650.

Consumption, Income, Operating, and Maintenance Charges.—Interesting data on the operation of city water-works is found in the official reports of the cities, and in the statistics of the operation of private companies, from which it is shown that in a long established works, irrespective of population, water supplied per day and income, the operating and maintenance charges, excluding expenditures for extensions and betterments, fixed charges on bonded indebtedness and taxes (which, of course, are paid only by private water companies), are roughly about 30 per cent of the income from water rents. In exceptionally well managed works, like those of Providence, R. I., and Milwaukee, Wis., in both of which meters form a part of the water supply system, the operation and maintenance charges are considerably less than 30 per cent of the income from water rents. In other works where the management is less systematic and rigid, or where the conditions connected with the supply of water are more onerous than in the cities mentioned, the operation and maintenance charges are considerably more than 30 per cent of the income. In determining the income

which should be received from water rents by a system of water supply, whether operated by the municipality or by a private company, in which it is known that the property is conducted in a careful and economical manner, it will often assist the managers to know the relation which the income from water rents should bear to the known cost of operation and maintenance, and this being known, to adjust the water charges equitably among the various kinds of consumers to produce the income required to meet all the natural charges created by a system of public water supply. These charges may be divided conveniently as follows: first, operation and maintenance charges; second, extension and betterment charges; third, taxes, if the works are owned and operated by a private corporation; fourth, the fixed charges on the cost of construction or bonded indebtedness; fifth, an annual allowance for the renewal of such parts of the works as, for example, pumping engines and boilers, which are subject to a known rate of deterioration; and sixth, if the works are owned and operated by a private company, a reasonable allowance for dividends on the capital stock.

The last five items will usually absorb in round numbers about 70 per cent of the income from water rents.

The table below is an abstract from an elaborate compilation of statistics from the cities noted, which was used a few years ago in the trial of a cause in the United States courts to adjust a difference between the municipality and the water company. In this particular instance it was a well established fact that the works were well constructed, and operated upon a very careful and economical basis, and in order to furnish data upon which the court could safely fix the income to which the water company was entitled, it was necessary to arrive at this income in the indirect manner shown by the table.

Where the quantity of water to be pumped is small, it will often be found very convenient to use gas or gasoline engines and triplex pumps. Works up to 2,500,000, or more, gallons per day have been planned and are operating on this system. The advantage of the gasoline engine is that it entirely avoids the ex-

CITY	Years (inclusive)	Population	Mean Income	Mean percentage operating and maintenance charges	Mean gallons per capita per diem
Providence	1895-98	163,750	\$487,378	12.56	54.70
Lawrence	1895-98	54,417	99,759	39.53	57.50
Troy	1894-98	65,000	95,970	46.49	146.06
Albany	1895-98	100,908	276,233	33.53	153.90
Buffalo	1894-96	327,500	677,375	33.37	263.00
Erie	1895-98	50,883	124,546	33.07	114.87
Harrisburg	1896	39,400	96,193	27.15	160.00
Camden, N. J.	1896	58,313	130,667	26.79	205.79
Atlantic City	1896	13,055	30,590	37.47	346.00
Wilmington	1896	70,000	163,854	25.99	80.30
Cleveland	1895-98	345,070	613,563	31.30	139.87
Dayton	1896	61,220	71,000	30.00	62.50
Springfield, O.	1897-98	Not stated	39,768	32.56	Not stated
Wyoming, O.	1897-98	1,800	6,788	30.63	56.56
Detroit	1895-98	280,288	566,228	30.53	135.15
Indianapolis	1897	179,630	393,562	27.34	56.76
Elgin	1896	20,000	29,404	30.44	45.00
Louisville	1893-95	194,408	337,355	29.52	72.90
Milwaukee	1895-98	268,125	458,720	25.46	90.78
St. Louis	1892-97	342,167	1,261,861	30.00	29.33
Kansas City	1896-98	160,852	411,611	30.16	60.00
Nashville	1895-98	98,949	130,267	25.71	128.50
Atlanta	1893-98	201,700	50,355	33.71	47.90
Toronto	1896-98	197,325	459,796	26.95	114.67

WATER TABLE—WATER WHEEL

pense for boiler house, the cost of operating and maintaining boilers, the expense of chimneys, and if the water is pumped to reservoirs, whenever the machinery is temporarily out of service there is no cost due to banking fires and maintaining steam pressure, as is the case with a steam operated works. See **WATER-WORKS**.

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Water Table, in architecture, a projecting stone sloped on the roof to throw off water. It occurs in buttresses and other parts of Gothic architecture.

Water Thermometer. See **THERMOMETER**.

Water-thrush, an American warbler of the genus *Seiurus*, having terrestrial habits and frequenting preferably the borders of streams; its domed nest in the woods gives the name oven-bird to the common resident species (*S. auricapillus*). See **WARBLER**; **WAGTAIL**.

Water Turbine. See **TURBINE**; **WATER WHEEL**.

Water-turkey. See **DARTER**.

Water Valley, Miss., city, one of the county-seats of Yalobusha County; on the Illinois Central railroad; about 140 miles north by east of Jackson, the State capital, and 15 miles north of Coffeeville, the other county-seat. It was settled in 1855 by William Carr; incorporated in 1867, and chartered as a city in 1890. It is in an agricultural region, in which cotton is one of the principal products. It has considerable lumbering interests. The chief manufacturing establishments are cotton mills, railroad repair and construction shops, in which there are 500 men employed, a lumber mill, foundry and machine shops, and woodworking factory. The city owns and operates the electric-light plant and the waterworks. There are seven Church denominations, the Methodist State Orphan's Home, the McIntosh Training School, and public schools for both races. The two banks have a combined capital of \$48,000. The government is vested in a mayor and board of aldermen consisting of seven members elected every two years. Pop. (1890) 2,832; (1900) 3,813; (1910) 4,708. G. D. BROWN,

Editor 'The Progress.'

Water Wheel, a device by which the motive energy in falling water is utilized to perform mechanical work. Water acts as a motive power by its weight, or by pressure and impact, and the water wheels adapted to these various conditions may be divided into two general classes—the "vertical," consisting of the "overshot," "breast," and "undershot" wheels; and the "horizontal," which includes a great variety of turbine or reaction wheels. The impact or impulse wheels are included in both classes. The term water wheel is correctly applicable to all forms of water motors that rotate, but in the present case it will be restricted to those of the vertical class which are actuated mainly by the weight of water loaded on their circumferential parts. For those belonging to the horizontal class, see **TURBINE**.

The overshot wheel is provided with a number of buckets fixed to its periphery in such a way that as the wheel revolves from left to right the buckets on the descending side have their tops upward, and being filled with water at or

near the top of the wheel, exerts a downward pull and imparts a rotary tendency to the wheel. The water is admitted to the wheel by various methods, such as the overfall sluice, the penstock, and the guide bucket, in all of which the water is guided in a course tangential to the buckets, and acts partly by impact, but principally by weight. To obtain the greatest efficiency, the number of buckets ought to be as large as possible and so arranged as to hold the water as long as practicable. The buckets vary in form, but the greatest effect is obtained from curved buckets, the "radial" giving only about 75 per cent of the power obtainable by the use of "elbow" buckets. Overshot wheels may be constructed of wood or iron in any size. The earlier forms were massive structures built of wood, and often measured 70 feet in diameter, but the modern wheels are generally built of iron and are practically limited by construction to falls less than 60 feet in height.

In the breast wheel the water is received by the buckets above the centre and below the top of the wheel. It is most effectively employed in connection with falls ranging from 5 to 20 feet, and where the flow ranges from 5 to 90 cubic feet per second. The buckets are generally held in a curb, and, not being required to hold water, are set radially. Their number is made as large as possible, and they are set at such an angle that they leave the water vertically so as not to carry up water from the tail-race. The breast wheel is more effective than the overshot under a variable water supply, since it can be made of a greater diameter and affords an increased facility for the reception and discharge of the water by the buckets.

The undershot wheel receives the water below its horizontal centre line. Instead of buckets it is equipped with a series of paddles or vanes fixed to the periphery in such a way that the flowing water passes under the wheel, pushes against the paddles, causing rotation. It is usually set in a curb with a minimum amount of clearance for the escape of the water. The most effective curbs are concentric to the wheel, those set straight or tangential allowing too much waste. The paddles are set radially and inclined upward in order to be readily relieved of water upon the return side.

For falls not exceeding six feet, the most effective wheel is the Poncelet. In it the water acts in a manner very similar to its action in a turbine, and although not quite as efficient as turbines working under normal conditions, it is superior when working under a reduced water supply. The buckets are curved, and the water flowing along their concave sides presses upon them without impact and with greater effect than that of water impinging at right angles against buckets with plane surfaces. The effect of the wheels increases with the depth of the water, and the velocity of rotation is equal to about one half the velocity of the flowing water. The simplest form of the "impact" wheel consists of a series of rectangular buckets fixed upon a wheel at an angle varying from 50 to 70 degrees to the horizontal. The water is conducted to it through a pyramidal flume set at an angle varying from 20 to 40 degrees, so that it strikes the blades nearly at right angles. The normal effect is about 5 per cent of the total mechanical power of the flow, but this may be increased somewhat by increasing the length of

WATER-WORKS

the paddles, so that the water exerts a combined impinging and pressing force.

In another form, known as the "impulse" wheel, a series of cup-shaped buckets attached to the periphery of the wheel are acted upon by a jet of water conducted by a pipe and delivered through a nozzle tangentially against the cups. Of this form the most notable are those of the Pelton type, which vary from 5 to 20 feet in diameter and are extensively employed to work air compressors in mining operations. A wheel of the maximum size is capable of developing 350 horse-power, under a 700-foot head of water.

In general, as compared with turbines, vertical water wheels are the more effective when applied to falls ranging from 20 to 40 feet. The turbines are more efficient with low falls, on account of the great hydraulic resistance developed by very high falls, which increases as the square of the velocity. On the other hand, since turbines are run at a greater number of revolutions, they are more suitable to general mechanical purposes, while vertical wheels are better for purposes requiring low velocities, and in the operation of rolling mills where the varying resistances are controlled by the mass of the wheel.

There is not much difference in the cost of construction, but the durability of the turbine is less than that of the vertical wheel.

Bibliography.—Good descriptions of water wheels are scattered through the various engineering periodicals. Especially valuable data may be obtained from Weisbach, 'Hydraulics and Hydraulic Motors,' English translation by Du Bois (New York 1877); and Bjorling, 'Water or Hydraulic Motors' (London 1894). See also **TURBINES**; **WATER-POWER**; **WATER MOTOR**.

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Water-works, systems of machinery and engineering structures, employed to supply water to individual manufacturing, mining, and milling plants, and to municipalities, for domestic and industrial uses. Such systems existed during very early periods of history, and the water-works of ancient Greece, Carthage and Rome may be readily traced and studied by the ruins of their reservoirs and masonry aqueducts. In these earlier systems, gravity was depended upon for the delivery of the water, but force pumps were introduced about the middle of the 16th century, and extended greatly the general application and use of water-works systems. Of these the water-works built at London Bridge by Peter Maurice 1562 appear to be the first. The installation consisted of 16 force pumps, each 17 inches in diameter, and 30 inches long, which were driven by a current wheel, and raised 311,000 gallons of water per day to a reservoir at an elevation of 120 feet above the pumps, and from which the water was delivered by gravity, through lead pipes to buildings in the immediate vicinity.

In the United States, the first pumping plant installed to provide water for municipal purposes, was that at Bethlehem, Pa., about 1760. It consisted of a five-inch wooden force pump, which raised water to a height of 70 feet through pipes of bored hemlock logs. This was replaced in 1761 by three single-acting iron pumps, each 4 inches in diameter, and of 18-inch stroke, op-

erated by an undershot water-wheel. The first municipal water-supply system built in America, however, was that of Boston, in 1652. It was built by the Water-Works Company, and consisted of a reservoir about 12 feet square, to which the water from springs in the vicinity was conveyed through wooden pipes. From 1652 up to the close of the year 1800, the water-works plants in the United States numbered 16, and had been located and built at the following named cities: Boston, Mass., 1652; Bethlehem, Pa., 1754-1761; Providence, R. I., 1772; Geneva, N. Y., 1787; Plymouth, Mass., 1796; Salem, Mass., 1795; Hartford, Conn., 1797; Portsmouth, N. H., 1798; Worcester, Mass., 1798, Albany, N. Y., 1798-1799; Peabody, Mass., 1799; New York City, 1799; Morristown, N. J., 1799; Lynchburg, Va., 1799; Winchester, Va., 1799-1800; and Newark, N. J., 1800. With the exception of the plants at Winchester and Morristown, they were all built by private concerns, but passed into the ownership of the respective municipalities from time to time up to 1860. The works at Winchester were built by the municipality, and those at Morristown were built by a private concern and still remain in private ownership. From 1800, up to the present time (1904), the number of plants installed throughout the country amounts to about 3,200, of which 1,700 are under municipal, and 1,500 under private control.

A clear and concise consideration of the subject of water-works may be facilitated by arranging the various requirements under the four general headings—quality, sources of supply, modes of distribution, and public policy.

Quality expresses the fitness of the water for the various purposes for which it may be required. A good quality of water is characterized by a freedom from turbidity and color, unpleasant taste and odor, and sewage contamination.

Turbidity is a condition caused by clay and silt suspended in the water. When the source of supply is a river, this condition is subjected to great variations according to the amount and character of the rainfall over the watershed. Heavy rains of short duration are drained off with great erosive effect, and introduce into the flowing rivers vast quantities of finely divided inorganic matter. This impurity, however, is more offensive than harmful, unless taken into the system frequently or in large quantities. It is removed by the use of large settling reservoirs where the water is allowed to rest and deposit the heavier particles, before it is passed over the filter-beds by which the smaller particles are removed. (See **WATER SUPPLY**.) Color is a condition still more offensive to the eye than harmful to the health. The apparent color due to turbidity disappears under the processes of sedimentation and filtration, but true color, generally due to infusion of vegetable organic matter, such as leaves, grass, etc., is much more difficult to remove.

Odor is a condition which, although less frequent, is much more harmful than turbidity or color. As a rule it is due to the life processes of minute organisms, and is removable to a considerable degree by filtration.

Sewage contamination is the most harmful of all the various forms of impurities natural or artificial that a water supply may be subjected to, and is the direct cause of epidemics of typhoid fever and various troubles of the intes-

WATER-WORKS

times, which by undermining the constitution reduces its power of resistance to diseases. The water may be somewhat purified by filtration, but the proper method is to remove the source of pollution.

The quality of water is ascertained by various kinds of analyses, physical, chemical, and bacteriological, which, however, at their best, are only capable of indicating the probable safety or danger of a given sample of water. Physical analyses consist merely of comparisons of the given samples with standard solutions, and afford data relative to temperature, turbidity, color and odor.

Chemical analyses indicate the time of past contamination, and the nature of its origin—animal or vegetable. Bacteriological analyses are principally used to ascertain the absence or presence of the growths which cause bad taste and odor. Such analyses are capable of showing the number and probable origin of the bacteria present, but in matters of differentiation, as in the case of the typhoid germ from the harmless water bacteria, their operation is quite uncertain.

The results obtained by any set of analyses are generally interpreted by chemists and engineers by comparing them with other known facts, without attempting to establish a system of arbitrary standards. A minimum limit of impurity, however, may be stated, as follows:

(1) The best authorities consider water as bad or polluted when 100,000 parts of the liquid contain more than three parts by weight of mineral matter or one part by weight of dry organic matter, before it has been submitted to precipitation, or when it holds in suspension more than one part by weight of dry organic matter after 6 hours of perfect repose in a reservoir.

(2) When the same amount of liquid contains in solution more than two parts by weight of organic carbon, or three parts of organic nitrogen.

(3) If it exhibits a distinct color under daylight when placed in a white porcelain dish, to the depth of one inch.

(4) When 100,000 parts of the liquid contain more than two parts by weight of any metal except calcium, magnesium, potassium and sodium.

(5) When 100,000 parts of the liquid contain in solution, suspension, or chemical combination, more than 0.5 of metallic arsenic.

(6) When 100,000 parts of the liquid, after the addition of sulphuric acid, contain more than one part by weight of free chlorine.

(7) When 100,000 parts contain more than one part by weight of sulphur in the form of sulphuretted hydrogen, or a soluble sulphuret.

(8) When 100,000 parts of the liquid holds in suspension more than 0.5 of petroleum or hydrocarbon, or exhibits a film of the same upon its surface.

(9) When the acidity is greater than that produced by two parts by weight of hydrochloric acid to 1,000 parts of distilled water.

(10) When the alkalinity is greater than that produced by adding one part by weight of caustic soda to 1,000 parts of distilled water.

(11) When a cubic centimetre of water contains more than 250 bacteria.

In general, a large percentage of chlorine, and high nitrates, together with the presence of *coli communis*, a bacteria found in large quanti-

ties in the human intestines, indicates sewage contamination.

A very simple but reliable test for sewage contamination was suggested by Heisch. To half a pint of water placed in a clear colorless glass-stoppered bottle, add a few grains of the best white lump-sugar, and expose the bottle freely to daylight in the window of a warm room for a week or ten days. If the water remains clear it may be considered safe, but if it becomes turbid, it is open to grave suspicion of sewage contamination.

Turbidity or a precipitate due to the addition of baryta water indicates the presence of carbonic acid; chloride of barium indicates sulphates; nitrate of silver indicates chlorides; oxalate of ammonia indicates lime salts; sulphide of hydrogen, slightly acid, indicates antimony, arsenic, bismuth, calcium, copper, gold, lead, mercury, platinum, silver and tin; an alkaloid by ammonia solution of sulphide of ammonium, indicates alumina, chromium, cobalt, iron, manganese, nickel and zinc. While the chloride of gold or mercury and the sulphate of zinc indicate organic matter.

Hardness of water is a quality that bears chiefly upon its use for washing purposes. The hardening impurities are principally the salts of lime and magnesia. Their carbonates produce temporary hardness which may be removed by boiling, when the carbonic acid is dissipated and the insoluble bases are deposited as incrustations on the bottoms of the kettles and boilers. The carbonates are less troublesome to the human constitution than to steam users, but the sulphates, chlorides and nitrates of lime cannot be dissipated by ordinary boiling and are productive of what is known as permanent hardness. Ordinarily pure water can take up only about 2 grains of carbonate of lime per imperial gallon of 70,000 grains, but when carbonic acid is present, that amount of water will dissolve as much as 20 grains of the carbonate. The degree of hardness is estimated according to the number of grains of soap the solution is capable of neutralizing. Thus, one, two, and three degrees of hardness represent the neutralization of 10, 20, and 30 grains of soap, respectively. The amount of waste, in the wear of clothes and soap, and the destruction of many valuable food properties by the use of hard water is not fully appreciated by the general public. It is safe to state, that the money value of that waste far exceeds the cost that would supply an abundance of water for domestic purposes from a source free from impurities.

Systematic processes for softening water have been employed but rarely in the United States, and then principally in connection with the boiler and locomotive manufacturing plants. The first process was invented by Prof. Thomas Clark, of Aberdeen, Scotland, and 1841, and consists of mixing the water supply with lime water or milk of lime, and allowing it to subside for a period ranging from 12 to 24 hours, when the water is drawn off while the precipitate is left behind. The only softening plant in connection with a municipal water supply in America is that attached to the water-works of the city of Winnipeg, Manitoba. The source of supply is a number of artesian wells, and the water obtained is of a very hard quality. The softening process employed is a modification of that of Clark, and includes a variety of set-

ting and filtering devices, into which the water is pumped and mixed with the lime solutions and then drawn off and distributed by direct pressure pumping into the mains. Its working, although not satisfactory in many ways, provides a water more beneficial to the health, and superior for domestic purposes, than that of the Red River, which formed the original water supply of the city. (See WATER SOFTENING.)

While boiling is a very cheap and thoroughly effective process of purifying water, and may be used by householders in general, distillation, owing to its expense, may be employed only in special cases, in connection with artificial ice plants, the conversion of salt into fresh water at sea, and in the various industrial arts. It will be noted, however, that both boiled and distilled water are very unpalatable unless aerated before used for drinking purposes.

Sources of water-supply will be found extensively treated under that title. In a general way, the origin of all sources is the atmosphere. It is a simple matter to trace the course of the water from the clouds in the form of rain to the rivulets which form the feeders to the lakes and rivers, and which percolating through the porous rocks and earth, issue as sparkling springs along the valleys. Some special suggestions, however, relative to the selection of a potable water is advisable in this connection. In the open country water reaches the ground in a fairly pure condition, and by selecting a site isolated from the drainage of barnyards, house sewerage, and fertilized gardens, an excellent quality of water may be obtained from a well. Extending the application to where the supply is for the use of a community, town or small city, subterranean reservoirs in which the great rain percolations are stored up, may be tapped by artesian wells and furnish an inexhaustible supply of pure water. In boring these wells, however, a thorough knowledge of the geological structure of the region is important (see ARTESIAN WELLS), in order to avoid unsuccessful and costly boring operations, as well as to obtain a sufficient quantity of water free from sub-surface impurities. Waters percolating through or over the crevices of granite, gneiss, serpentine, trappean, mica-slate or silicious sandstone and drift formations, are usually quite pure, since the disintegrations of such formations are not soluble in pure water. On the other hand, limestones and chalks impart objectionable qualities. Carboniferous rocks are often composed largely of mineral salts, and the water penetrating such strata are of a briny nature and are wholly unfit for domestic use. This is the case in the Kanawha Valley, and in some parts of Ohio, West Virginia, and the State of New York. In the bituminous limestones of the oil regions of Pennsylvania, the waters passing through those strata are saturated with petroleum compounds, while the dark waters issuing from the sulphurous rocks of the Niagara group of the Ontario geological division carry a high percentage of sulphuretted hydrogen.

As the municipality requiring the water increases in size, the quantity obtainable from a source of supply becomes more and more important. The per capita consumption varies greatly and very often quite unexplainably. See WATER SUPPLY.

In the ancient cities of Jerusalem, Rome,

Byzantium and Alexandria, the consumption amounted to 300 gallons per capita, daily.

In 1870, the water consumed by the principal European cities, in gallons per capita, was as follows: London 20, Liverpool 27, Glasgow 40, Paris 30, Marseilles 40, Genoa 30, Geneva 16, Madrid 16, and Berlin 18. On the other hand, it is not an unusual thing to find American cities consuming all the way from 100 to 250 gallons per capita. Without doubt, a great deal of the water in such cases is really wasted, but American hydraulic engineers in planning for a water supply under the present conditions, calculate upon the basis of a consumption of 100 gallons per capita, with provisions to meet an increased demand in the near future.

A fair average daily consumption may be approximately estimated as follows, in gallons per capita, on a basis of total population: For ordinary domestic purposes, 20 gallons; for private stables, including carriage washing, 3 gallons; commercial and manufacturing purposes, 16 gallons; fountains, drinking and ornamental, 10 gallons; fire protection, 3 gallons; private hose and sprinkling of streets and public grounds, during the four or five driest months of the year, 10 gallons; waste to prevent the freezing of water in the service pipes and house fixtures in northern cities, during the three coldest months of the year, 10 gallons, and waste by leakage, and for flushing purposes, 10 gallons; a total of about 80 gallons.

Thus for the larger cities, the selection of a source of supply passes from the wells and springs to the large ponds and lakes. Important examples of such are found in the cities of Chicago and Milwaukee, which draw their supply from Lake Michigan, and Cleveland and Buffalo, from Lake Erie. In the majority of cases the principal cities of the world obtain their water from rivers, although a great many, as in the case of New York, which draws its supply from Croton Lake, have adopted certain natural basins and converted them by artificial means, such as dams, etc., into immense reservoirs, fed solely by the rainfall over the drainage area. In such cases the principal mode of delivering the supply at the point of consumption is by gravity, through aqueducts, connecting the source of supply with the distributing mains. Intermediate settling and filtering reservoirs may be employed in connection with the source of supply to neutralize the conditions of turbidity, color, etc., inherent to surface waters, while auxiliary pumping stations may be built and operated in connection with standpipes if any part of the area using the water happens to be higher than the level of the source of supply.

On the other hand, when a river is the source of supply, its natural position in the lowest part of the valleys compels the elevating of its waters before delivery to the consumers. This is usually accomplished by pumping plants which elevate the water into reservoirs or standpipes from which it is distributed by gravity, or it is pumped direct into the distributing mains and thence into the service pipes. In either case, in planning a system of water-works, it is essential that proper provisions be made to insure a pressure of delivery that is constant and adequate to supply the consumption per capita for all domestic and industrial purposes, and of sufficient power to throw fire streams over the tops of ordinary buildings. A combination of the gravity

WATER-WORKS

and pumping systems is employed by the city of Washington. From the Great Falls of the Potomac, situated several miles west of the city, the water is conveyed through a conduit to receiving reservoirs on the heights adjacent to the city and after a period of subsidence is passed into the distributing reservoirs and thence to the service mains. Certain portions in the north-western and northeastern parts of the city being higher than the receiving reservoir, pumping stations connecting with the distributing mains pump the water into standpipes in the elevated sections, from which it is delivered to the consumers by gravity. As a rule, the cost of establishing pumping systems to lift the water from the river from a point near at hand to the standpipes, is far less than that of building the necessary aqueducts to conduct the water from a point on the river a sufficient distance beyond to insure the required head or pressure. In the case of Washington, however, the arrangement is practically necessary since the sewage of the city flows into the river in the immediate vicinity, and the current of the river itself is affected by the ebb and flow of the tide to some distance above the city, so that the water immediately at hand is in a polluted condition. In this connection it may be mentioned that but a very small number of American cities are fortunate enough to obtain an abundant supply of water directly from natural sources sufficiently transparent and limpid for domestic purposes. The great majority are compelled to resort to artificial means of various kinds, such as storage and settling reservoirs, filter beds, and pumping plants, to insure the purity and quantity required.

The character of "pumping plants" varies according to the source and mode of supply, the motive power employed, and the working pressure on the pumps. In connection with the source and mode of supply, such plants are arranged for direct pumping, or for pumping into a reservoir. Direct pumping plants are liable to be affected by great and sudden changes in working pressure and therefore require machinery capable of responding quickly to such changes, with strong and simple working parts automatically regulated under variable speeds. On the other hand, since the machinery employed to pump into a reservoir works against an almost constant head or pressure, at a practically uniform rate of speed, a much greater latitude is presented in the economy of design and operation.

As a general rule, when the source of supply is more than 25 feet below the surface of the earth, economy in the matter of excavations and foundations compels the use of some form of a vertical rather than a horizontal pump. If the well is very deep two sets of pumps, one at the bottom and one at the surface, may be employed, or by the use of the air lift, the motive power may be kept at the surface of the ground. On the other hand, when the water has to be pumped from a river to a settling reservoir for purification, and then repumped into the distributing mains, under conditions involving a comparatively low lift, some form of horizontal or centrifugal pump is the most suitable. See PUMPS AND PUMPING MACHINERY.

Relative to motive power, it is evident that water power, when it can be obtained in a sufficient amount, is the ideal source of energy, since it is generally inexhaustible and always

cheap. If, however, it cannot be obtained during the whole year, it may be supplemented by steam or electric power, or by a system of storage reservoirs arranged to equalize the flow of the stream under the varying conditions of wet and dry seasons. The employment of steam, electric and compressed air power to operate pumping plants depends to a great extent upon the cost of fuel used. When the pumping plants are situated at points far from the fuel supply, they may be operated economically, within the limits of economical electric power transmission, by power derived from dynamos driven by steam-engines or the energy of waterfalls. Compressed air may be used to operate small plants located at a distance from the main plant, and also to operate air lifts where deep wells are the source of supply, while oil and gas engines are the most economical for operating isolated secondary pumping plants in large cities, or the main pumps of small towns and villages. It is a fact, however, that in a majority of the water-works throughout the world, steam is the motive power employed, the pumping engine usually combining the motive power and pump action in one machine. They are of several different types, and the adoption of any particular one depends practically on the cost of the fuel used. When that cost is great, high duty engines, although more expensive in design and construction, but capable of performing a relatively larger amount of work with a small amount of fuel, are adopted. See PUMPS AND PUMPING MACHINERY.

For specific information on the construction of reservoirs, filter beds, tanks and standpipes see WATER SUPPLY. In general, the most important point to be considered in planning a system of water-works, is that of procuring an ample and suitable supply of water. To insure this, natural bodies of water, such as ponds and lakes, are connected with reservoirs by dams across their outlets, or by large masonry structures, partially in excavation and partially in embankment, from which reserve supplies of water are drawn off into the distributing system to maintain a constant pressure under varying demands. Tanks and standpipes are practically small reservoirs, usually located above the ground, on wooden, steel, or masonry towers. Their specific application has been described in connection with pumping plants.

Standpipes placed upon the force mains are employed by several American cities, whose reservoirs are distant from their pumping stations to equalize the resistance against the pumps. Those at Louisville, Milwaukee and Saint Louis are examples. Other cities, such as Chicago and Toledo, where proper reservoir sites are unobtainable, use open-topped standpipes of considerable height, ranging from 150 to 275 feet. They serve as partial substitutes for relief valves acting in conjunction with tall chambers. In the standpipes the surface of the water rises and falls according to the rate of delivery into them by the pumps and the rate of draft when the main over which they are placed is connected with the distributing system. In northern cities they have to be housed to prevent the water from freezing during the winter.

The water obtained by any of the methods already described is supplied to the consumers by distributing systems comprising the various kinds of mains, service pipes, house fixtures, valves and hydrants which control the flow and

the delivery of the water, while various kinds of meters record the amount consumed and afford a basis for taxation. See WATER METERS.

Such systems often include distributing reservoirs, tanks, and standpipes, and sometimes auxiliary pumping plants. They usually consist of one or more trunk mains from which numerous branch pipes, continually diminishing in size, lead through under the surface of the streets and connect with the various buildings. The mains are usually of cast iron, although wooden pipes have been and are even at the present time used under certain conditions. Under a direct pressure system, when the water is pumped through such a pipe, it is called a force main. Originally they were of wrought iron, but proving unreliable were superseded by cast iron and finally by those of riveted steel. See PIPES AND PIPE MANUFACTURE.

The size of water mains depends upon the required volume and velocity of the water conveyed, and vary from 48 to 72 inches in diameter. Pipes leading to fire hydrants should not be less than four inches in diameter, and when of that size should be restricted to lengths not exceeding three or four hundred feet and leading to a single hydrant. Service pipes are usually of lead or wrought iron. Lead pipes, although more expensive, are preferable on account of their flexibility, smooth interior surface, great durability, and relative non-corrosiveness. Plain wrought-iron and galvanized-iron pipe corrodes so rapidly that it is unfit for use unless coated both inside and outside by asphaltum or varnish of some kind. Various substances have been applied for that purpose from time to time, while interior linings of cement have been used extensively; but the present practice is confined to the application of an asphaltum bath, with perhaps the most satisfactory results obtainable. It consists simply of a mixture of coal tar and asphaltum in proportions that will give a coating non-brittle at the freezing point.

Valves are employed to control the water as it flows into the mains and from them into the service pipes. Pipes are always liable to accident through excavations for buildings, sewers, electric conduits, overflows, and quicksand and clay slides. It is also very often necessary to shut off the water when new hydrants are attached, or when large pipe connections or repairs are made. Under such circumstances means to maintain a constant supply at and beyond the points involved are best obtained by a duplicate arrangement of sub-mains in parallel lines at several squares distance, joined across by a system of smaller service mains, so that there are always at least two lines of sub-mains around any given point. Under such conditions stop-valves may be used with advantage to shut off the water from a particular point without cutting off the supply from what may be a large territory lying beyond. Stop-valves are made in a great variety of forms, but the best have double self-adjusting disks, with the seats slightly divergent, so that the pressure of the screw sets the valve-disks snug upon the seats. They are usually located on the mains under some invariable system so that they may be readily found in case of accident when hidden by a cover of frozen earth, snow, or other debris. Blow-off and waste valves are attached to pipes laid upon undulating ground, and are used to

flush out the sediment deposited from unfiltered water, in the principal depressions of mains and sub-mains. Their diameters are usually about one half that of the mains from which they branch and they may be led into sewers or wherever the waste water may be disposed of. Valves commonly known as corporation cocks regulate the flow into the houses and are usually set near the curb. Check valves act against a backward flow of water and are useful on force mains to protect the meters against back pressure, while reducing valves are employed to relieve depressed areas of a city from excessive pressure where an effective division into high and low service is impracticable. They operate automatically, under the hydraulic pressure in the mains in which they are located, while the other forms are operated by hand or may be operated by electrical connections. Valves are expensive contrivances, and the cost of the larger sizes may be often reduced by the application of the Venturi principle, the larger pipes being gradually contracted to the size of a small valve, and then gradually increased to the original size without much loss of pressure.

Hydrants are valves used for fire-fighting and flushing purposes. In post or fire-hydrants, a vertical tube extends from the valve to a certain height above the ground. They are usually set on a branch pipe, at or near the curb line, and may be provided with from one to four nozzles, according to the capacity of the service mains, for the attachment of fire-hose. They are made in an innumerable variety of patterns; a first-class hydrant, however, consists of a frost case that is free to move up and down as the ground expands and contracts under varying temperatures, without straining the hydrant base; a waste valve that will drain the hydrant effectually as soon as the main valve is closed, and which will close automatically as soon as the main valve begins to open; a main valve that is positively tight, which if it closes "with" the pressure will be free of any slack motion of its stem and thus prevent a severe water-ram at the moment it is closed; a screw motion of the valves requiring at least ten complete revolutions before the valves are seated, thus insuring a slow closing and preventing the excessive shock and strain on the valves of an entire system that may result from a water-ram caused by the simultaneous closing of several hydrants. A stop-valve is usually placed between the main and the hydrant, so that the latter may be repaired without shutting off the flow through the mains. Hydrants should not be placed more than 500 feet apart, while in a closely built business district they may be placed at very close intervals.

Waste by leakage from the mains, and poorly constructed flushing devices, varies from 5 gallons upward per capita, and its reduction to a minimum is essential to the economical operation of any system of water-works, but it is especially important when the source of supply is distant and the purity of the water depends upon the conservation of its quantity. This can only be accomplished by careful workmanship in the construction of the plant; careful pipe laying; the use of high-grade, self-closing plumbing fixtures, especially those devices used for flushing water-closets, and the installation of meters not only to detect leaks and other causes of waste in the houses, but to form the basis for charges

WATER WORSHIP—WATERBURY

against the consumer and compel carefulness on his part. This, however, brings the matter to a point where it is necessary to harmonize good practice with public policy. The details of district meter systems, and the inspection of service pipes are minor problems as compared with the equitable adjustment of water rates according to the various classes of consumers. In general, although the district plan is but a poor competitor of the house meter system, it has produced good results in controlling waste and detecting leaks whenever it has been employed, and is worthy of more careful consideration, and extensive application in the various water-works systems throughout the United States.

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Water Worship, a feature of nature worship, and one of the primitive superstitions of mankind. Water was not worshipped as an element, but in its various forms of well and spring, river and ocean. Every spring and river was supposed to have an animating deity, who could be propitiated or offended, and the worship of these divinities was a prominent part of Greek and Roman cult, especially in the rural districts.

Waterboro, wá'tér-bûr-ô, Maine, town in York County; on the Portland & Rochester Railroad; about 25 miles southwest of Portland. It contains the villages of Waterboro, East Waterboro, South Waterboro, North Waterboro, Waterboro Centre, and Ossipee Mills. It was settled in 1767, and in 1789 was incorporated. The town has flour and lumber mills, an apiary for breeding bees, and considerable dairy interests. Pop. (1910) 997.

Waterbury, a city of Connecticut, in New Haven county, the fourth in population in the State, and one of the most important manufacturing centres in New England. It is situated on both sides of the Naugatuck River, 21 miles above its junction with the Housatonic, 22 miles northwest of New Haven and 32 southwest of Hartford. In January, 1902, by an amendment to the charter, the city became co-terminous with the town, so that it now covers an area seven or eight miles square. Its physical features are greatly diversified. Its streams and wet lands probably suggested its name, given to the town at the time of its incorporation. Its earliest designation, "Matetacoke" (shortened to Mattatuck), means a place or land without trees, and had reference probably to the primeval meadows on the Naugatuck.

History.—The first attempt at a settlement was made in 1674, by men of Farmington, on the high land west of the river, known ever since as

the Town Plot. The breaking out of King Philip's war led to the abandonment of this site, and the planters, when they returned, settled on the east side of the river, nearer to Farmington, calling the place the Town Spot. The settlement was formed under the order of the General Court, upon the payment of about £2,500. The men numbered 31, and for 26 years no outsider was admitted as a proprietor. Mattatuck was incorporated as a town (of Hartford county), with a change of the name to Waterbury, in 1686, occupying then a territory about eight miles wide and 18 miles from north to south.

For more than a century its growth was slow. In addition to the natural disadvantages of the situation, there were such disasters as the "great flood" of 1691 and the "great sickness" of 1712. The organization of a church—always an important event in a New England plantation—did not take place until 1691. The town and parish were identical until 1738, when Westbury (now Watertown) was set apart as an ecclesiastical society. Northbury (now Plymouth and Thomaston) secured similar rights in 1739, and thenceforth the original parish became known as the First Society. The church belonged, of course, to the Congregational denomination. No other existed in the territory until 1737, when Episcopal services were introduced. The town was represented in the Revolutionary War by about 800 men, an extraordinary number.

Throughout its history, Waterbury has suffered seriously from fires. The losses in 1880-81 and in 1892-94 were exceptionally large, but were far surpassed by those of the great fire of 1902, which amounted to more than \$2,000,000. A fire company was organized in 1828 and several others later, and a fire department was established under the first city charter in 1854. This has developed, much after the fashion of other cities, into a paid department, with a chief engineer, and equipped with a modern automobile apparatus.

Manufactures, etc.—The conditions that surrounded the settlement of the town and limited its agricultural prosperity became an important factor in its subsequent development. Under the discipline of poverty and hardship, a group of men grew up who possessed inventive genius, and, in addition, patience, economy, and pluck. When the manufacturing era opened, these men were at the front, ready to make use of their opportunities, while the rapid streams of the region furnished the necessary water-power. The farmers' sons became manufacturers—makers of clocks and buttons—and along the several streams little factories and mills grew up, whose products met the growing demand of the time. It was in response to this demand, emphasized by the War of 1812-15, that the brass industry of Waterbury received its early impetus—an impetus which was enhanced anew, and very greatly, by the war for the Union. By 1840 the manufacture of sheet metal and wire had taken the lead of all others. But there were many uses to which sheet brass could be applied beside button-making, and Waterbury manufacturers were quick to discover them. The great manufactories are still known locally as "rolling mills," but the articles produced in them are of endless variety. Through the latter half of the 19th century the bulk of the brass manufacture was carried on by six concerns, one of which came into existence in 1802, and an-

WATERBURY

other a few years later. These six manufacturing concerns still hold (in 1912) their prominent position, but meanwhile others have sprung up and attained to great importance, some devoted to one specialty and some to another, and several of them rivaling in the extent of their product the older establishments. Buttons, buckles, pins, hooks and eyes, suspenders, harness trimmings, rivets, wire, tubing, gas fixtures, lamps, brass kettles, boilers, clocks, watches, spoons, forks, flasks, percussion caps, photographic materials, coins for South American republics—things of all kinds made wholly or in part of brass—are sent forth from their packing rooms by hundreds of thousands, and shipped to all parts of the world. The chief seat of the brass industry in America is the Naugatuck Valley, and Waterbury is its dominant centre. There are also important establishments quite outside of the brass industry—machine shops of national reputation, foundries, manufactories of cutlery, of hinges, of traps, of aluminum goods, paper-box factories, and various others. The number of Waterbury concerns which organized under the "Joint Stock Law" of Connecticut between 1843 and 1911 was about 300. One hundred of these were companies working in metals; the rest were corporations manufacturing other materials, or mercantile and miscellaneous concerns. Many of these have ceased to exist, but the surviving corporations number 169. In 1845 the capital employed in manufactures amounted to \$653,825; in 1890, the amount of the capital was \$17,682,500, and the value of the product, \$17,712,820; and, in 1910, the amount of the capital was \$35,000,000, the value of the product \$50,350,000, and the total of wages paid \$12,000,000. Through all this period Waterbury men were busy as inventors. The first United States patent was granted to a descendant of a Waterbury miller; the second was granted to a resident of Waterbury—in 1796. The number of patents issued up to 1890, in proportion to the number of the inhabitants, was as 1 to 405, while the proportion of Connecticut patents to the population of the State was as 1 to 706. The city has seven banks, including four savings banks, also three trust companies.

Railroads and Transportation.—Electric cars run through the main streets and beyond the city limits in every direction to the neighboring towns. The headquarters of the western division of the New York, New Haven and Hartford Railroad are in Waterbury and express train service is given both to New York and Boston with local service on branches extending to Middletown, to New Haven and to Watertown. There are stage lines as of old, to Naugatuck, Middlebury, and Woodbury; also the usual local and national express companies, and the usual telegraph and telephone facilities and a messenger service. The product of the Waterbury manufacturers in the line of mailable goods is so immense that the business of the post-office is exceptionally large. The receipts for 1911 were \$169,231, exclusive of money orders. The money order business amounts to nearly a million dollars annually.

Water Supply, Lighting, Etc.—The water supply is abundant and good. A reservoir was established on East Mountain in 1868, another on Cooke street in 1880, the Wigwam Reservoir

in 1901, and in 1909 the building of the Morris Reservoir on the west branch of the Naugatuck, 11 miles north of the city, was begun. These reservoirs have a total capacity of 2,735,000,000 gallons of water. There are 83 miles of water pipe, and the daily average of water used in 1911 was 7,196,254 gallons. A sewerage system was introduced in 1883, but the discharge of sewage into the river was strongly objected to by persons and establishments located below the outfalls. In August 1904, the city began the building of a trunk sewer, and a sewage disposal plant some miles down the valley. The city has been lighted by gas since 1854. Electric lights were introduced in 1884, and were substituted for gas lights on the public streets not long after. Since 1904, the current which supplies the lights and also furnishes the motive power of the trolley system, is brought across the country from the Housatonic River.

Streets, Parks, Buildings, Etc.—The city is divided into four sections, as the town has been from its settlement, by two main streets, one running east and west, the other nearly north and south. There is also an informal division into districts, some of which represent the school districts of the earlier time. The most important of these are Brooklyn, Waterville, Hopeville and Bunker Hill. At the intersection of the main streets there is a central park or green, adorned with stately elms, at one end of which stands an elaborate soldiers' monument (erected in 1885, by popular subscription), and at the other end a handsome drinking fountain. The development of Hamilton and Chase Parks—valuable gifts to the city—was begun in 1903. The public buildings worthy of mention are the courthouse, the post-office, the Bronson Library, the Second Congregational Church, Saint John's Church (Episcopal), Saint Patrick's Church (Roman Catholic), the building of the Young Men's Christian Association, the Girls' Industrial School, the Lilley building, the Citizens' Bank, the Elton Hotel and the Buckingham building. Plans have been prepared for the erection of a fine new City Hall to take the place of the structure burnt in 1912.

Education, Etc.—School affairs were at first conducted by the town, and afterward by a "school society," which divided the town into fourteen districts. In 1849, chiefly with a view to establishing a high school (the old academy having suffered a decline), five of the districts were incorporated as a Centre district, under the management of a Board of Education, a Finance Committee and a Superintendent of Schools,—leaving a circle of outlying districts under the old management (a Board of School Visitors). In 1899 the bounds of the city were extended and made co-terminous with those of the Centre district, and the earlier and somewhat cumbrous organization was superseded by a Department of Education, consisting of the Mayor and a board of seven members. When, in 1902, the city was finally made co-terminous with the town, the traditional status of the outlying districts was preserved. The Superintendent of Schools reported in 1911: Children (enumerated), 20,347; enrolled in the public schools, 12,895; buildings, 30; school-rooms, 308; teachers, 347; expenditures for 1911, \$531,928.

WATERBURY — WATERCOURSES

Kindergartens, Domestic Science, Manual Training and Sewing Departments have been established in all of the schools, and the evening schools have been conducted since 1856. An open-air school was established in 1912. The first high-school building was destroyed by fire in 1870; the third was erected in 1895-1911 at a cost of \$225,000. Pupils enrolled in other than public schools in 1911 numbered 4,500. These other schools include Saint Margaret's School for Girls (the Diocesan School of the Episcopal Church), the Academy of the Convent of Notre Dame, five large parochial schools and various smaller schools. The Bronson Library, founded in 1868 by a bequest of \$200,000 from a native of the town, contains more than 86,000 volumes, and has a very wide circulation every month. The present building was erected in 1893-94, at a cost of \$63,500, and the fund now amounts to \$250,000. There are three daily newspapers—the *Waterbury American*, established in 1844; the *Waterbury Democrat*, and the *Waterbury Republican*, both dating from 1881. The town has made a very respectable record in pictorial art, sculpture, music, and literature.

Societies.—Various literary, musical, and scientific societies and social clubs have been organized, the most active of which are the Waterbury Club, incorporated in 1881; the Women's Club, established in 1889; the Daughters of the American Revolution (1893), the Naturalists' Club (1897), the Mattatuck Historical Society, organized in 1877 and incorporated in 1902, and the Country Club, incorporated in 1908. The various Masonic bodies and mutual benefit fraternities number more than 175. The National Guard of Connecticut is represented by Companies A and G of the Second Regiment, for whose use an armory was built in 1883. The Young Men's Christian Association, organized in 1858, occupies a building which cost \$40,000. Other philanthropic organizations are the Industrial School (for girls), the Boys' Club, the Young Women's Friendly League, two day nurseries, a free kindergarten, Protestant and Roman Catholic temperance societies, and the Southmayd Home (for aged persons). Waterbury has two large modern hospitals, the Waterbury Hospital and the St. Mary's Hospital, costing considerable over one-half a million dollars. The present almshouse was built in 1893, at a cost of \$80,000. Of the several cemeteries of the town, Riverside (opened in 1853) is noteworthy for its picturesqueness and for its monuments. A memorial chapel stands at its main entrance.

Religion.—Waterbury contains 35 churches and three Union chapels. Probably two-thirds of the population are Roman Catholics, and the Catholic churches number 10. Five of the Protestant churches are Congregational, three Episcopalian, four Baptist, five Methodist, three Lutheran, and one Adventist. There is also a corps of the Salvation Army, a society of Christian Scientists, and two Jewish synagogues.

Government.—In 1825 the population lying around the centre of the town was organized into a borough. The incorporation of the city took place in 1853, with a population of about 4,000. A new charter, obtained in 1871, was superseded by another in 1896, to which important amendments were made in 1899 and 1902. Under

this third charter the city is divided into five wards, and the government is conducted by a mayor and 15 aldermen, through a number of boards, each having charge of one of the following departments: Of Public Works, of Public Safety, including the police and fire departments, of Public Health, of Charities, of Education, of Finance; also a Board of Assessors, a Board of Relief, and a Board of Agents of the Bronson Library. There are also superintendents of streets, of the water works and of sewers, and a city engineer. Besides the Police Court, there is a District Court, which has jurisdiction beyond the limits of the city, and sessions of the Superior Court are held in Waterbury.

Population.—The successful conduct of manufactures so extensive and varied in an inland Connecticut valley has involved a large and steadily increasing immigration. The growth of the city since 1850 has been greatly augmented by the steady inflow of foreigners. The population in 1790 numbered 2,937, in 1850, 5,137; in 1860, 10,004; in 1880, 17,806; in 1890, 28,646, in 1900, 51,139. The U. S. census of 1910 reported the population at 73,141, the per cent. of increase being 59.5. The percentage of residents of foreign birth or parentage is, with one exception, the largest of any Connecticut town, and the number of nationalities represented is remarkable. At the same time, the condition of the community, socially and morally, is exceptionally good. Waterbury is noted for the superior grade of the homes of its working people. Strikes have occurred very rarely—never in the large manufactories—and, although the saloons number 175, there is but little intemperance or other visible crime. Wealth is more uniformly distributed than in most cities, the question frequently arising whether there are any millionaires in the community. The valuation of property, real and personal, in 1911 was \$66,385,300.

Bibliography.—Bronson, 'History of Waterbury' (1858); Bassett, 'Waterbury and Her Industries' (1888); Anderson, 'The Town and City of Waterbury from the Aboriginal Period to the Year 1895' (1896); also 'Charter and Ordinances of the City of Waterbury' (1902), and the annual 'Municipal Register.'

JOSEPH ANDERSON.

Waterbury, Vt. town in Washington County; on the Waterbury River, and on the Central Vermont Railroad; about 11 miles northwest of Montpelier. It contains the villages of Waterbury and Waterbury Center. The location, in a beautiful valley, is most picturesque. The principal manufacturing establishments are grist and lumber mills, brick works, tannery, boot and shoe factory, sleigh and carriage works. There are six churches, Green Mountain Seminary, and graded schools. Pop. (1910) 3,273.

Watercourses, in law, streams of water usually following a well-defined channel and emptying into some other body of water. A watercourse need not maintain a constant current, but it must be more than an occasional stream, the result of unusual rains or the melting of snow, and following a channel customarily dry. See **RIPARIAN RIGHTS**; **WATER RIGHTS**.

WATEREE — WATERLAND

Wateres, a river of South Carolina, formed by the junction of the Catawba River and Fishing Creek, and is called the Catawba in the upper part of its course. It runs nearly southward, forms the east boundary of Chester, Fairfield, and Richland counties, and unites with the Congaree River at the southwest extremity of Sumter County to form the Santee River.

Waterfall, a sudden descent in the water of a river or stream from a higher to a lower level. When the water falls over a precipice it is called a cataract, and when several cataracts occur in succession it is called a cascade. Some of the mountain waterfalls are remarkable for their height, while others are noted for the fall of immense quantities of water. The most remarkable waterfall in the world is Niagara Falls on the Niagara River, between Lakes Erie and Ontario, and thousands of visitors from all parts of the world have admired the sublimity of these falls. Waterfalls are now being utilized to furnish both electric and water power for commercial purposes. The falls discovered by Dr. Livingston in Africa and named by him Victoria Falls, the falls of the Rjukanfoss in Norway, the Cascade of Gavarnie in the Pyrenees, and the falls of the Rhine are among the most beautiful in the world, and justly celebrated. For a fuller description see CATARACTS.

Waterford, Ireland, a maritime county in the province of Munster, bounded on the north by Counties Tipperary and Kilkenny, on the east by County Wexford, on the west by County Cork, and on the south by the Atlantic. It has an area of 717 square miles. The coast is bold and rocky, but has several good harbors. The surface is generally mountainous and there are many marshes. Agriculture is carried on to a limited extent only. In 1901 the total extent of lands under crops was 53,745 acres, including meadow and clover, 78,373 acres. Bacon and butter are the chief exports. There are some minerals in the county, but little is done in the way of mining. Some limestone and marble are quarried. The fisheries on the coast give employment to several hundred men. The chief towns in the county are Waterford, Dungroven, and Tramore. The county is divided into two parliamentary divisions, East and West, and had a population of about 90,000.

Waterford, Ireland, capital of County Waterford, and a county city, on the right bank of the Suir, connected with its north suburb of Ferrybank, by a bridge. Of six Catholic places of worship, including a cathedral, the finest is the Dominican Church of Saint Savior, erected (1878) in the Italian style, the Protestant Episcopalians have also a cathedral and two churches. Other buildings are the Protestant Episcopal palace, the Catholic College of Saint John, Saint Dominic's Industrial School, four convents, a town hall, market house, etc. Considerable sums have been expended in deepening the channel of the Suir, whose south bank is fringed for a mile by a spacious quay, while on the Kilkenny side is a shipbuilding yard, with a patent slip, graving bank, and dock. Besides two immense bacon-curing establishments, Waterford has iron foundries, flour mills, breweries, etc. A memorial of Waterford's foundation by the Danes in the 9th century is "Reginald's Tower" (1003), which has witnessed the city's capture by Strongbow (1170), the repulse of Cromwell and surrender of Ireton (1640-50),

and the embarkation of James II. after the battle of the Boyne (1690).

Waterford, N. Y., village in Saratoga County; on the Hudson River at the mouth of the Mohawk River, and on the Champlain Canal and the Delaware & Hudson Railroad; 2 miles above Cohoes and 10 miles north of Albany. It has extensive water-power, and is a manufacturing village. The chief manufactures are knitting mills, foundry and machine shops, fire-engine shops, paper and flour mills, boiler works, and a furniture factory. In 1900 (government census) there were 58 manufacturing establishments, capitalized for \$2,593,021. The raw material used annually cost \$1,544,719, and the value of the finished products was \$2,066,060. It has a Union Free School, public and parish elementary schools, free library, and one private bank. Pop. (1910) 3,245.

Waterhouse, Alfred, English architect: b. Liverpool 19 July 1830; d. London 22 Aug. 1905. He studied architecture under Richard Lane in Manchester, and afterward in France and Italy. He began practice in Manchester in 1853, and first made his name known by the Assize Courts of that city. For the same city he afterwards designed the County Jail, Owens College, the Town Hall, Saint Mary's Hospital, and other buildings. In other parts of England he was responsible for the following among other buildings: in Liverpool, Seaman's Orphanage, Turner Memorial Home, Royal Infirmary, and University College; in London, Natural History Museum, New Saint Paul's School, City and Guilds Central Institution, King's Weigh House Chapel, and University College Hospital; in Oxford, Balliol College (partly rebuilt); in Cambridge, Caius and Pembroke colleges (partly rebuilt); in Leeds, Yorkshire College; the mansions of Eaton Hall (Cheshire), Heythrop (Oxford), and Iwerne Minster (Dorset). He was elected A.R.A. in 1878, and R.A. in 1885, and in 1898 became treasurer of the Academy. He received a Grand Prix from the Paris exhibition of 1867, and was a member of various foreign academies. In 1878 he was awarded the gold medal of the Royal Institute of British Architects, of which he was president 1888-90.

Waterhouse, John William, English painter: b. Rome, Italy, 1840. He studied at the Royal Academy and his paintings are noted for the richness of their coloring. His paintings include: 'The Oracle' (1884); 'The Magic Circle,' 'The Lady of Shalott,' and 'La Belle Dame sans Merci.'

Waterland, Daniel, English clergyman: b. Lincolnshire 14 Feb. 1681; d. 23 Dec. 1740. He studied at Cambridge, became master of Magdalen College, chaplain to George I., and canon of Windsor. Waterland was an able defender of the Orthodox faith against the Deists. His chief writings are: 'A Vindication of Christ's Divinity, being a Defence of some Queries relating to Dr. Clarke's Scheme of the Holy Trinity' (1719), followed by a second (1721) and third (1725) 'Vindication'; a 'Critical History of the Athanasian Creed' (1724), also directed against Clarke; 'Christianity Vindicated Against Infidelity,' a reply to Tindal's 'Christianity as old as the Creation'; and a 'Review of the Doctrine of the Eucharist' (1737), directed against Hoadley's rationalistic theory of that ordinance. Consult: Van Mildert, 'Life of Daniel Waterland'

WATERLINE — WATERLOO

prefixed to Waterland's 'Works,' in 6 vols. (1843).

Waterline, in shipbuilding, the boundary of any section of the bottom of a ship made by a plane parallel to the line of flotation. The uppermost one is called the load water line; the lowest the light water line.

Waterloo, Stanley, American author and journalist: b. Saint Clair County, Mich., 21 May 1846. He was graduated from the University of Michigan in 1869, engaged in journalism, was one of the owners of the *Saint Louis Journal* in 1872, was subsequently editor of the *Saint Louis Republic*, *Chronicle*, and *Globe-Democrat*, and in 1884 established the *Saint Paul Day*. He was later editor-in-chief of the *Chicago Mail*, and has been engaged on various other journals. He has written: 'A Man and a Woman' (1892); 'Honest Money' (1895); 'These are My Jewels' (1902), etc.

Waterloo, Canada, (1) A town of Waterloo County, Ontario, two miles northwest of the capital, Berlin, on a tributary of the Grand River, and on a branch line of the Grand Trunk Railway to Elmira. It is an industrial centre, with iron foundries, manufactures of agricultural implements, textiles and tobacco, breweries, and distilleries. Pop. (1901) 3,537. (2) The capital of Shefford County, Quebec, and a railway junction, on the Stanstead, Shefford & Chambly Railway, 70 miles east by south of Montreal. It has lumber and flour mills, a brewery, tanneries, and manufactures of mill-machinery, agricultural implements, iron castings, and furniture. Pop. about 2,000.

Waterloo, England, a town and watering-place of England, on the Lancashire coast, four miles north-northwest of Liverpool, forming with Seaforth one urban district. Pop. about 25,000.

Waterloo, Ill., city, county-seat of Monroe County; on the Mobile & Ohio Railroad; about 20 miles south of Saint Louis, Mo. It is in a fertile agricultural region, in which the chief products are wheat and corn. In the vicinity are quarries of fine building stone, known in the trade as Waterloo marble. The chief manufacturing establishments are flour mills, marble works, a large brewery, an ice factory, and bottling works. There are large stock yards and coal and lumber yards. The educational institutions are a high school, founded in 1891, Saint Joseph's School (R. C.), public and parish elementary schools, and a school library. The two banks have a combined capital of \$35,000, and deposits amounting to \$253,930. Pop. (1910) 2,091.

Waterloo, Ind., town in De Kalb County; on the Cedar Creek, and on the Lake Shore & Michigan Southern Railroad; about 25 miles north of Fort Wayne. It is the commercial centre of an extensive agricultural section, in which wheat, corn, and vegetables are the chief products. It has seven churches, a high school, founded in 1872, graded elementary schools, and two banks. It was founded in 1857, and in 1864 was incorporated. Pop. (1910) 1,167.

Waterloo, Iowa, city, county-seat of Blackhawk County; on the Cedar River, and on the Illinois Central, the Chicago, Rock Island & Pacific, and the Chicago, Great Western R.R.'s; about 95 miles west of Dubuque. It is in an ag-

ricultural and stock-raising region, and has considerable manufacturing interests. The chief manufacturing establishments are foundries, machine shops, gas-engine works, thrashing-machine factories, and automobile works, and manufactories of refrigerators, manure spreader, and egg cases. The government census of 1900 gives the number of manufacturing establishments as 147, which were capitalized for \$1,287,056. There were employed as wage earners 1,042, to whom were paid \$471,608. The raw material used cost \$1,555,578, and the annual products were valued at \$2,499,361. The manufacturing industries had increased from 1900 to 1903, so that in December of the latter year there were 2,726 employees. The principal public buildings are the government building, the county court-house, municipal buildings, and the Presbyterian Hospital. There are 31 church buildings. The educational institutions are two public high schools; the East High School, founded in 1872, and the West High School, in 1870; Our Lady of Victory Academy (R. C.), public and parish elementary schools, Waterloo Business College, and school libraries. The seven banks have a combined capital of \$4,188,103 (December 1903). The government is vested in a mayor and a council of eight members elected biennially. The majority of the inhabitants are American born; of the foreign born the Germans predominate, then the Irish, and the Scandinavians. Waterloo was settled in 1845-6 by G. W. Hanna and Charles Mullan. It was incorporated as a town in 1868. Pop. (1890) 6,674; (1900) 12,580; (1910) 26,693, an increase of 112 per cent.

J. C. HARTMAN,
Editor 'Courier.'

Waterloo, N. Y., village, one of the county-seats of Seneca County; on the Seneca River, the Cayuga & Seneca Canal, and on the New York Central & Hudson River Railroad; about 18 miles west of Auburn and 55 miles east of Rochester. It is in an agricultural region, but the village has several manufactories, chief of which are large woolen mills, lumber mills, piano factories, wagon and carriage works. It has a high school founded in 1843, public elementary schools, and a public library. The two banks have a capital of \$125,000, and deposits amounting to \$434,270. Pop. (1910) 3,931.

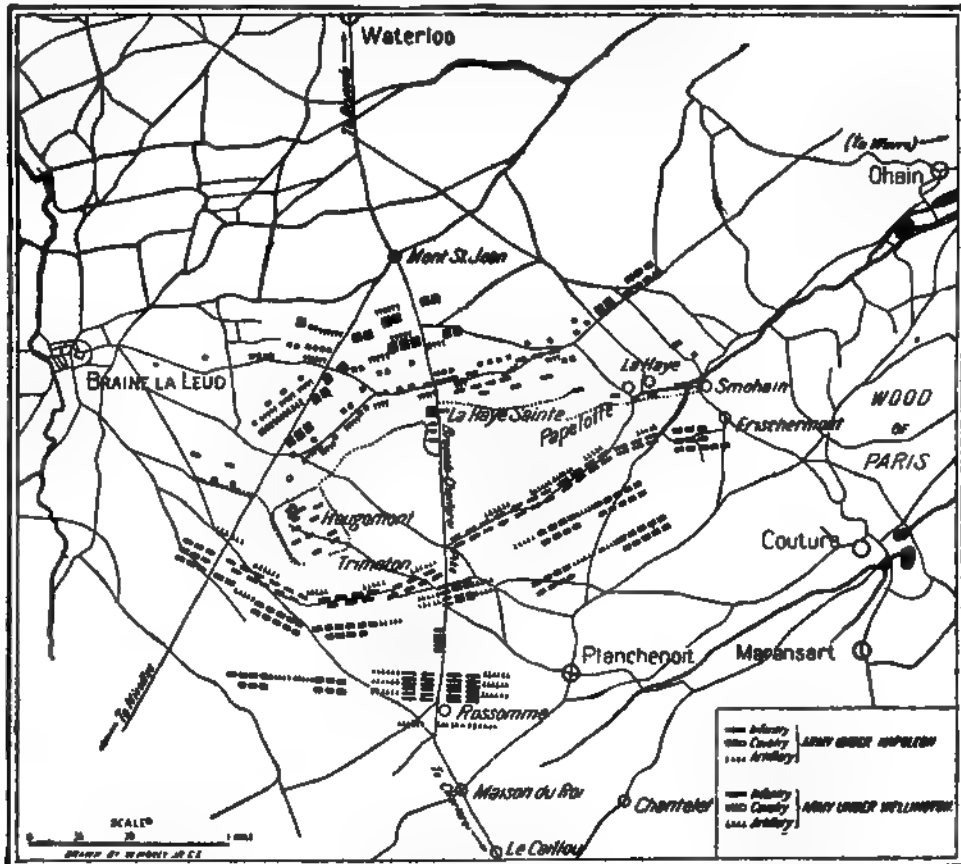
Waterloo, Battle of, the culminating engagement of the shortest and most decisive of all of the Napoleonic campaigns, was fought 18 June 1815, near the village of Waterloo, in Belgium, situated about 12 miles south of Brussels. From 11 April 1814, when Napoleon signed the first abdication and retired in exile to Elba, until 20 March, when he terminated the period of that retirement and returned to Paris, the political and domestic affairs of France had been bordering on revolution. Although the administration of affairs by the government established by the Comte du Provence, who, under the title of Louis XVIII., had taken unopposed possession of the country, restored political liberty, the changes inaugurated were so sudden, that it unsettled all domestic affairs, the title of estates, the position of public men, and the prospects of the army to an intolerable extent. A general sense of alarm and humiliation prevailed among all classes, and even a Napoleonic period seemed preferable to the existing conditions. To add to the general turmoil, about 300,000 troops who

WATERLOO

had been held as prisoners in the various German fortresses were released under treaty stipulations and returned to France. Their apparent availability for further operations soon formed the basis for innumerable military plots of which that designed by Fouché, with the ultimate object of placing either the Duke of Orleans or the King of Rome upon the throne, was the most important.

Napoleon was fully conscious of the existing state of affairs. France was down, groveling at the feet of the Allies. Here was the opportunity for a truly patriotic action. He would give popular liberty to imperial France, and

dred Days with professions of peace and liberty, the Allied Powers suspended negotiations at the Congress at Vienna, issued a declaration branding him as "an enemy and disturber of the peace of the world," and formed a new Coalition to renew the struggle against him. By the beginning of June they had more than 700,000 men in the field, and he was compelled to take active measures to defend his newly recovered empire. The French army amounted to about 500,000 men, on paper, but only about 200,000 men were available for actual field service. In planning the campaign, Napoleon had the choice of confining himself to purely defensive operations and



Field of Waterloo. (Showing positions of the two armies at 11 a. m., 18 June 1815.)

henceforth devote all his energies to strengthen that liberty and increase that prosperity. He counted upon the enthusiastic support of the army which was fretting under the command of emigres who had once fought against France, but were then being appointed to important commands, and felt sure of the effect of his tremendous military fame upon the general military feeling of the country. He thought of Marengo; how in three short months he had lifted France and himself from the lowest ebb of fortune up to the highest pinnacle of military glory and power. He judged correctly in all these things. He left Elba 20 February, and landed on the coast of France 1 March, and entered Paris triumphantly 20 days later.

While Napoleon was inaugurating the Hun-

allow the Allies to invade France, or of assuming the offensive, and relieve her of the consequences of a second invasion. He chose the latter, and laid the scene of the campaign in Belgium where the English under the Duke of Wellington had their headquarters at Brussels, and the Prussians under the command of Marshal Blücher, at Namur.

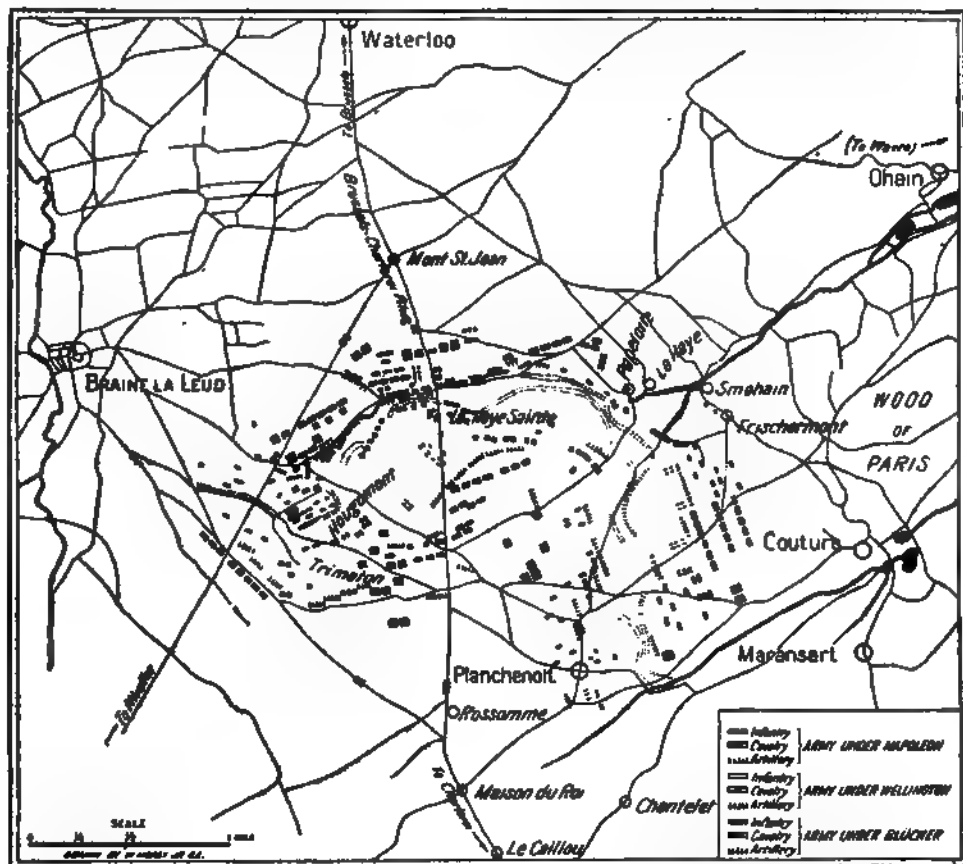
The general plan of operations was based upon his favorite form of strategy—action on "interior lines" against the two armies opposed to him. He assumed that Wellington and Blücher would endeavor to form a junction at Charleroi, and determined to concentrate the bulk of his own army at that point and defeat them separately before they could effect that junction, and then turn his attention to the force

WATERLOO

of Austrians and Russians gathering on the eastern border under the command of Prince Schwarzenberg.

At the beginning of the campaign the French army numbered 124,588 men—89,415 infantry, 23,595 cavalry, 11,578 artillery with 344 guns. Wellington commanded 93,717 men—69,829 infantry, 11,879 cavalry, 9,406 artillery and engineers, with 196 guns. The Prussian forces under Blücher amounted to 120,954 men—99,715 infantry, 11,897 cavalry, and 9,360 artillery, with 312 guns. Wellington's forces, composed of Englishmen, Dutch, Belgians, Nassauers, Germans, and Brunswickers, were stationed in numerous cantonments scattered over a large area

noon of the 16th, and after several hours of hard fighting were driven back upon Frasnes. In the meantime, with the intention of blocking the road between Quatre-Bras and Sombreffe so as to separate the forces under Wellington and Blücher, the troops commanded by Napoleon himself, attacked the Prussians at Ligny, and after three hours of severe fighting, defeated them and captured 21 guns. The battle was desperate and bloody; about 12,000 Prussians fell, and in the final charge of the Guard, Blücher himself was wounded. This was Napoleon's last victory. As the result of the battle, he assumed that the Prussians had been routed and were retreating to their base by way of



Field of Waterloo. (Showing positions of the three armies at 7:30 p. m., 18 June 1815.)

around Brussels, and to the westward of the Brussels-Charleroi pike leading to the south, with the coast as their base. Of Blücher's force, the First corps, under Ziethen, was at Charleroi, the Second, under Pirch, at Namur, the Third, under Thielmann, at Ciney, and the Fourth, under Bulow, at Liège, with the Rhine as their base.

The movement began on 13 June. The French army advanced rapidly northward, crossed the Sambre on the afternoon of the 15th, attacked Ziethen's position, drove him back upon Fleurus, and occupied Charleroi. A portion of the army then continued the advance through Gossillies to Quatre-Bras where they met a force of 25,000 men under Wellington, on the after-

Namur and Liège, when, as a matter of fact, under the direction of Gneisenau, Blücher's chief of staff, they were moving northward and converging on Wavre, with the intention of joining Wellington, with whom they were in constant communication. About noon of the 17th, Napoleon detached Grouchy with 33,000 men to pursue and complete the defeat of the Prussians driven back at Ligny, while he himself with the main body of the army joined Ney and followed Wellington, who, although victorious at Quatre-Bras, had been forced to fall back northward toward Brussels on account of the defeat of the Prussians at Ligny. Wellington's retrograde movement was continued during the whole of the 17th, until he had reached the heights of Mont

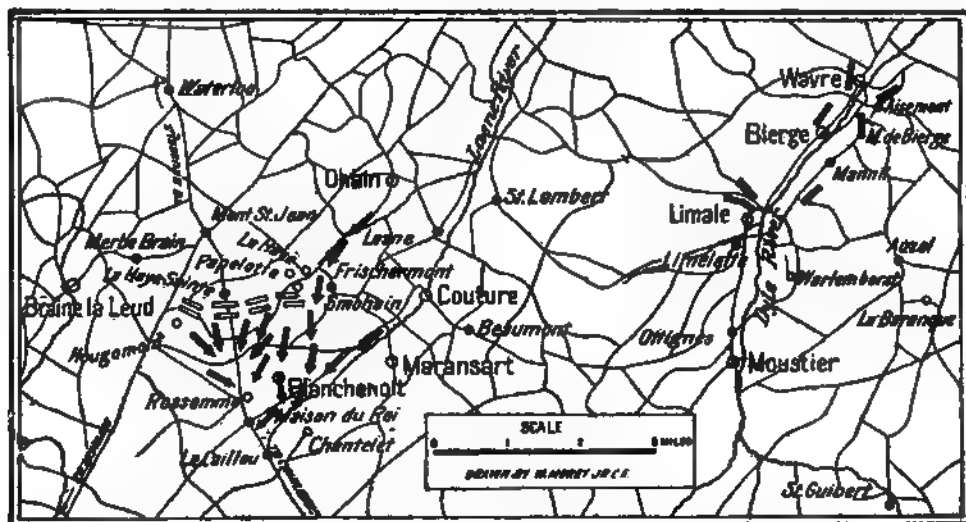
WATERLOO

Saint Jean, about four miles south of the village of Waterloo, where the Prussians could join him by way of Ohain and Wavre. Here he selected his position, and confident of their assured support, he awaited the advance of the emperor.

On the afternoon of the 17th, when Napoleon reached Marbain, he received the information that the Prussians defeated at Ligny had not retreated to Namur and Liège, and he sent a message to Grouchy informing him of that fact, and instructing him to find out if the Prussians were moving to a junction with Wellington. When Grouchy received this message he was actually farther from the Prussians than the Prussians were from Wellington, and about the time he reached Gembloux, about 10 o'clock on the night of the 17th, only to learn that the Prussians had really marched to Wavre, the main French army had reached the field of Waterloo and bivouacked opposite the forces of Wellington. It was past midnight when Napoleon inspected the position of both armies. The main

on the Charleroi pike directly in the rear of Wellington's position and thus cut off his retreat in the direction of Brussels and his base of supplies. The best authorities concede that the plan was admirably conceived.

About 8 o'clock on the morning of the 18th, Wellington drew up his forces in line of battle, but although the rain which had been falling all night ceased about that time, the attack by the French was postponed so that the ground might be in better condition for artillery movements. A little before 9 o'clock Napoleon reviewed his lines, and about 10 o'clock he sent instructions to Grouchy to advance upon the Prussians at Wavre. The battle commenced at 11.30. As a diversion, a division of Reille's corps assaulted the British position at Hougomont, were repulsed, and were supported by division after division until the entire Second corps were in action against Wellington's left, and therefore did not take any part in the main attack on the British centre by D'Erlon about 1.30. In this attack, the advanced troops of the British right,



General Map. (Showing positions of the three armies at 8 p. m., 18 June 1815.)

line of Wellington's forces occupied an advantageous position along the highway that runs from Braine la Leud to Wavre by way of Ohain, with the centre resting on the Brussels-Charleroi pike, while strong outposts held the farm house of La Haye Sainte directly in advance of the centre, the hamlets of La Haye, Papellotte, and Smohain on the extreme left, and the chateau of Hougomont on the right. His force consisted of 67,661 men—49,608 infantry, 12,408 cavalry, and 5,645 artillery with 156 guns. Of these the British troops numbered only about 24,000. Napoleon had 71,947 men—48,950 infantry, 15,765 cavalry, and 7,232 artillery with 246 guns. He arranged his troops in two lines diagonally across the Brussels-Charleroi pike, the right resting on Frischermont, and the left across the road to Nivelles, with a strong force of infantry, cavalry, and artillery stationed in the rear on both sides of the Charleroi pike near Rosomme.

Early on the morning of the 18th, he dictated his plan of battle the direct object of which was to capture the village of Mont Saint Jean lying

composed of Bylandt's brigade, were easily routed, but the advancing French received a terrific fire from Picton's brigade, and being charged by the British cavalry, fell back in great disorder. Here General Picton who probably commanded the British right was killed. In the meantime, assault upon assault was made by the French on La Haye Sainte, which occupied the greater part of the afternoon, while for two hours, from 4 to 6 o'clock, under the personal direction of Ney, the splendid cavalry divisions of the French were hurled against the British right-centre, but failed to break the formation of a single British square. The cavalry attack being unsupported by infantry, Ney was compelled to withdraw for lack of troops, about 6.30, just as La Haye Sainte was taken, too late, however, to be of any advantage. About the middle of the afternoon Napoleon discovered the advance guard of the re-enforcing Prussians on the hills of Saint Lambert about three miles away upon his right, and realized for the first time that the entire Prussian force had succeeded in concentrating at Wavre, and were now on hand

to aid Wellington. He immediately detached Lobau with the Sixth corps, to intercept the new enemy, and sent a message to Grouchy, ordering him to return. Grouchy in the meantime, having moved off to Wavre in search of the Prussians, did not get this message until evening.

Lobau being unable to check the advance of the Prussians, the Young Guard was sent to reinforce him, and then, believing that his right was secure, Napoleon massed the eight remaining battalions of the Imperial Guard for a final attack upon Wellington's centre. Supported by a terrific artillery fire, and led by Friant, the Guard advanced, while D'Erlon hurled the First corps against the British right. D'Erlon's assault was effective, but the Guard decimated by a heavy fire from Maitland's brigade, supported by those of Halkett and Elphinstone, were repulsed with terrific loss and fell back in complete disorder before the impetuous charge of the Fifty-second Regiment. Just then, about 7.30, the main body of the Prussians arrived, and going right into action, attacked the French right and threw it into confusion. At that moment, Wellington seeing that victory was assured, ordered a general advance of his lines and decided the contest. His troops, however, were too far gone to engage in the pursuit, which was taken up by the Prussians with vigor, and the retreat soon became a rout. Napoleon left the field in the centre of a square of the Imperial Guard. He left this at Genappe, and arrived at Charleroi at daybreak with a small escort of horsemen. He reached Paris 21 June, and signed the second abdication on the 22d. The entire campaign had lasted but three days, and the battle itself, one of the most remarkable and terrible of modern times, was decided in eight and a half hours. The French lost in killed, wounded, and missing, about 31,000 men, and the Allies, about 23,000.

Bibliography.—The literature upon the subject is very extensive, but for the most reliable and exhaustive information consult: 'The Campaign of Waterloo,' J. C. Ropes, New York 1892; 'Waterloo Lectures,' Chesney, London, 1874, and 'Quatre-Bras, Ligny, and Waterloo,' Gardner, London 1882.

Waterman, Nixon, American author: b. Newark, Ill., 12 Nov. 1859. He was connected with the *Omaha World-Herald* and *Bee* 1887-90; with the *Chicago Herald* and *Post* 1890-3, and since 1895 has been engaged in literary work. He is the author of 'A Book of Verses' (1900); 'In Merry Mood: a Book of Cheerful Rhymes' (1902); 'The Whistling Girl,' a comedy (1902); 'Cap and Bells' (1903).

Watermelon. See **MELONS.**

Waterproofing, the art of rendering various substances impervious to the penetrating action of water. The purposes to which waterproofing is now applied are very numerous and the methods range from the early use of lead for building foundations, of tar for tarpaulin, oil for oil-skin, rubber for clothing, to various painting processes which claim for bases, substances capable of resisting the natural action of the elements, and which, invisible, impenetrable, insoluble, and imperishable, effectually render brick, stone, marble, terracotta, stucco, concrete, etc., impermeable to water. These proc-

esses are used to waterproof and insulate exterior and interior walls of buildings, for cold storage plants, for the lining of reservoirs, for monuments, etc.

Among the numerous methods of waterproofing, many of which are protected by patents, the greater number in general relate to a surface application of some composition, usually somewhat thicker than an ordinary liquid solution. The more widely known methods of waterproofing are those used in connection with textile fabrics, cloth, with cordage, leather, etc. Water-repellent materials may be divided into two classes according to their nature, first, the coarser tissues used for awnings, tents, oil-skins, tarpaulins, or canvas coverings for exposed merchandise, etc.; secondly, the finer tissues employed for the manufacture of waterproof clothing. The earliest process consisted in covering the tissue with tar, a method still employed for marine supplies, ropes, cordage, and coverings, and which has the advantage of giving solidity to the fibre, and at the same time preserving it. Drying oils, and particularly boiled flax-seed oil are still largely used to waterproof coarse tissues, and particularly for the oilskin overalls worn in rough weather by sailors. Oiled tissues, however, are heavy and lack comfortable suppleness, while their color and appearance militate against their extended use. One of the more widely employed processes for waterproofing the coarser tissues consists in impregnating the material with an insoluble soap such as those formed with copper, iron, zinc, and alumina. Copper soap is most universally used. The material to waterproof is first passed through a 20 per cent soap bath, then immersed in an eight per cent solution of sulphate of copper. According to its nature, the fibre absorbs a certain quantity, large or small, of copper soap. In the ashes produced by the burning of a square yard of canvas or linen tissue so treated, as much as 57½ grammes of copper is found, and nearly 29 grammes of copper is to be found in the cinders of the same quantity of cotton tissue. Copper-soap waterproofed materials present a characteristic greenish tint.

The manufacture of waterproofed materials for clothing has attained considerable importance. The fact, however, must be recognized that the results generally obtained are not altogether satisfactory, especially from a hygienic point of view. Absolute waterproofing cannot be obtained without wholly closing the pores of the tissue; thus prepared it is an efficacious protection from rain and from contact with water, in certain cases is of real service, but inconveniently prevents ventilation. While the garments are made watertight they are at the same time made airtight. The perspiration and natural moisture of the body are not allowed to escape, but are held in saturation in the clothing, rendering it impure, damp, and uncomfortable. The body is kept damp, and upon removing the outer garments the wearer is liable to chills and colds, hence, such waterproofing is unsuitable for prolonged personal wear.

The most diverse substances can be used for waterproofing textiles, if they are soluble in a liquid other than water, and can be spread over the surface of the material,—if they possess a certain suppleness, and neither alter the fibre

WATERPROOFING

nor the color of the tissue. Wax, balsamic gums, isinglass, spermaceti, metallic soaps dissolved in essential oils, a solution of shellac with borax are employed in waterproofing tissues. The cloth, whether of silk, cotton, flax, or wool, is usually rendered waterproof by the application of some solution of any of these substances to one or both surfaces. In many of the earlier processes, the cloth was immersed in a liquid, so as to become saturated with the waterproofing agent. An early patent was obtained for a method of rendering cloth waterproof without concealing its textile surface; the cloth in the first place is saturated with a waterproof composition; it is then dried on one side to form a hard film, while the other side is kept moist, and is afterward deprived of its composition by means of spirits of turpentine.

Frequently silk tissues are waterproofed by the use of gelatine rendered insoluble by an alumina soap. The material is impregnated by passing it through cylinders covered with swan-skin, afterward being steam dried. Woolen tissues are passed through a solution of acetate of alumina obtained by treating ordinary alum with acetate of pyrolignite of lead. A well recommended formula is to be found in the following solution: gelatine, half a pound; soap, half a pound; alum, three-quarters of a pound; water, 17 quarts; after 15 minutes boiling, the tissue is wrung out, dried and pressed.

Absolute waterproofing of textile materials is obtained by applying to their surface a thin layer of rubber. The first experiments were made in France by Besson in 1793; they were improved upon and perfected successively by Mackintosh and Hancock of Glasgow, Scotland, by Buttler and Guibal in France, and by Goodyear in the United States. As in the case of Macadam with road surfaces, the successful efforts of Mackintosh perpetuated his name in connection with india rubber waterproof garments. The material is prepared by spreading on the surface a semi-liquid layer of rubber dissolved in benzol, then submitting it to the action of heat to evaporate the solvent. Sulfuretted carbon, first employed to dissolve the rubber, was replaced by a mixture of benzol or coal naphtha and essence of turpentine, and later by benzol which alone is now used. In the treatment of cotton and linen cloth a small proportion of sulphur is generally added. A thin layer of this rubber solution is spread on the fabric by special machinery, after which the cloth is doubled, pressed and finished in calendars, the waterproof layer being thus in the centre of the finished material. (See RUBBER MANUFACTURES.) The offensive odor of waterproofed rubber garments may be remedied by treating them with aromatized vapors, or by dipping them in concentrated infusions of vervain root, of orris root, of lavender, of camomile, etc. Ammoniacal vapor and sulphurous acid can also be successfully utilized to relieve rubbered materials of their penetrating odor. The application of rubber is made on dyed material in thread or in piece. The use of paraffine as an impervious agent allows the tissue to be dyed after being waterproofed. Paraffined tissues are not soaked by water, which assumes a spheroidal shape and slides off the surface. Woolen tissues well cleaned by passing through a light and tepid bath of carbonate of soda and

soap, are dried, then steeped in a solution of paraffine, or petroleum ether, 60 to 100 grammes to the quart. They are afterward passed through roller pressers, dried in the open air, and sent to the dyeing vats.

As already pointed out, waterproof rubbered textiles are not only impervious to water, but also to air, and numerous other methods and processes have been introduced to produce fabrics which, while resisting rain, do not altogether obstruct ventilation. The consecutive dipping of cloths, as already explained, in soap and alum solutions, or in gelatine and gall solutions, or in a solution of acetate of lead and then in a solution of alumina, are resorted to with more or less success. Algin, obtained from seaweed, has been strongly recommended for the same purpose. Acetate of alumina, decomposed by heat, leaves an insoluble gummy residue of hydrated alumina, and has been utilized for waterproofing tissues. Material so treated, like the paraffined tissues, is not moistened by water, which assumes a spheroidal shape and rolls from its surface; the material also has the advantage of a certain amount of ventilation. The fibre is, in a certain manner, impregnated with alumina, but the intervals between the threads exist. Nevertheless, if the material is insufficiently stretched or submitted to repeated rubbings, water will pass through, so that the process is not perfect. Owing to these causes this waterproofing process was abandoned for the cloth employed in the manufacture of the uniforms of the French army. One of the most modern processes consists in treating the fibres in the solution before being manufactured into textiles, and the fabric thus produced, while rain-resisting, offers the same ventilation as ordinary materials. Fibre-mail, as it is called, is described as a clear, colorless substance held in solution for the purpose of treating silks, woolsens, cottons, feathers, paper, and other materials, so as to render them water-repellent and proof against dampness, mildew, and moths. The value of the process is further stated to be by no means limited to the water-repellent qualities given to the goods treated. The application of the solution leaves a coating upon each separate fibre which, by the action of heat, is cured or vulcanized upon and into the fibre, strengthening it and leaving it impervious and elastic. Among other advantages cited are the properties of giving weight and body to the finer textile fabrics, and by this means, where desirable, economizing material, the quality of the goods being greatly improved and never deteriorated; the process also gives luster and finish to fabrics, being especially valuable for silks, alpacas, etc.; gives elasticity and toughness to the fibres, preventing cracking and breaking, qualities valuable for felt hats, silks, etc.; deepens and fastens the colors in dyed goods; resists stains and spots in the lighter and more delicate goods; prevents woods from swelling and warping; preserves painted surfaces; and prevents polished or metal surfaces from rusting.

Fibre-mail is also successfully applied to leather and leather goods. Many compositions, some of them patented, have been long employed, for rendering leather waterproof by filling up the minute pores. Four or five may be briefly described as examples of the whole.

Boiled flax-seed oil, mutton-suet, yellow beeswax, and common resin are melted over a slow fire, and applied while hot to the leather, which is itself to be made slightly warm. Linseed oil, resin, white vitriol, spirit of turpentine, and white oak sawdust are the materials of another composition. Yellow beeswax, Burgundy pitch, turpentine, and linseed oil constitute a third. A fourth plan consists in applying to the leather a hot mixture of two parts tallow with one part resin. Another is to apply a coating of tallow to the leather and a second coating of one part copaiba balsam with two of naphtha. Caoutchouc, boiled for two hours in linseed or neat's-foot oil is mentioned as a final formula.

Paint and silica compounds, oils, varnishes, and gums, have long been experimented with for the preservation of buildings by waterproofing. Coating buildings with linseed oil has been a favorite method as affording some degree of protection against the deteriorating action of the elements. But linseed or flax-seed oil alone or mixed with colors, varnishes, and gums, has never proved wholly efficient to prevent the disintegration of stone, the weather staining of brickwork, the crumbling of mortar joints, and the efflorescence of soluble salts, contained to a greater or less degree in all brick, cement, and some varieties of stone; this is owing to the protective materials in themselves being subject both to chemical changes and to chemical action, when exposed for a comparatively short time to the weather. When linseed oil alone is used, should there be any lime or alkaline salts in the wall, these immediately saponify the oil and render it useless, the oil soon drying out and leaving a spotted or mottled surface. Paint is often seen peeling off from the mortar joints of a building and from the brick work as well, owing to the same cause, the caustic alkaline properties of the salts of lime saponifying the linseed oil in the paint.

Dry foundations are necessary in order to prevent moisture from rising by capillary attraction from the damp earth into the bases of walls or stoops. One or more perfectly waterproof courses near the foundations and above the level of the ground, should be introduced as a *"sine qua non"* to a good building. Otherwise, a constant state of dampness, affecting that part of the structure, is apt to produce staining and disintegration beyond redemption. Cement or slate will not effectually answer this purpose owing to their absorbent qualities. Asphalt, sheet lead, copper, or some other non-absorbent material should be used. Sheet lead as a waterproofing foundation is found in the ruins of Roman buildings 2,000 years old. One of the best processes hitherto employed for waterproofing the exterior and interior surfaces of the walls, is the paraffine compound process. The base of this compound is paraffine wax of special manufacture with refined creosote, etc. The method of application is to warm the wall to be treated, to the depth of about one quarter of an inch, thereby evaporating all humidity and rendering it more absorbent. The melted waterproofing material is then applied to the warm surface until absorbed into the pores. It there remains for a brief time in a liquid state, penetrating as deeply as the surface is heated, and gradually hardens as the surface cools. The

pores are thus permanently filled and rendered solid without altering the appearance of the stone, etc., treated. This waterproofing compound thus forced in by heat, and becoming solid when cold, is far more durable and effective than superficial applications of cold solutions, oils, or paints, applied in the usual manner, which do not penetrate far enough into the material, which soon perish, and which are liable to be chipped or rubbed off.

As a preservative of stone and marble, of monuments and statuary, vaults, etc., from the destructive effects of the weather so often observed in cemeteries, the process has proved of great value. For lighter stones, the process unfortunately acts as a dust and dirt collector.

A material successfully used in Europe is fluo-silicate of magnesia, technically known as Fluat. Its application both hardens and rain-proofs stone, but the effect is not instantaneous, as it takes a year to demonstrate itself.

Waters, wá'térz, Clara Erskine Clement, American writer: b. Saint Louis, Mo., 26 Aug. 1834. She is well known as a writer and lecturer upon art. Her writings include: 'Legendary and Mythological Art' (1870); 'Eleanor Maitland' (1881); 'Life of Charlotte Cushman' (1882); 'Stories of Art and Artists' (1887); 'Women Artists in Europe and America' (1903); etc.

Waters, Undergróund. A certain amount of the water that falls on the earth's surface passes underground, the percentage varying with the porosity of the surface materials. This absorption of water is due to the fact that all rocks are somewhat porous and considerably fissured. Sand and gravel deposits are very porous and can store from 5 to 15 per cent of their bulk of water. Sandstones have space between their sand grains, but their porosity varies greatly with size of grain and especially with the amount of cementing material filling the interspaces which in the case of quartzite and some highly calcareous sandstone, fills these spaces entirely. Most sandstones, however, are porous and many hold from 5 to 10 per cent of their bulk of water. Limestones are only slightly porous, but they are always traversed by joint planes and usually, toward the surface, by channels and caverns. Clays, shales and slates have but little capacity for water and the crystalline rocks, such as granite, have very slight porosity. Crystalline rocks, however, are usually traversed by many joint planes and often by zones of decomposition along which surface waters descend for a greater or less distance. In many districts, also, the crystalline rocks are deeply decomposed by the solution of some of their components, and the resulting "rotten rock" is usually as porous as many sandstones. Many lavas are porous and they usually are extensively fissured. Water passes underground in various ways, of which the following are the most prominent: direct inhibition of rainfall; the sinking of surface flows in passing over zones of porous rock; the spreading of streams laterally into the porous deposits of their valleys; and the percolation of water laterally from the ocean or lakes into the materials of the shore. In all regions it is found that the surface run-off and evaporation do not equal the rainfall, which is evidence of general inhibition of water. Many streams are observed

WATERS

to diminish in volume and even to disappear entirely in running over areas of porous sandstones, cavernous limestones, or especially permeable portions of their beds. In many arid regions, waters flow out of the mountains in rock beds and at once sink in the sands of the valleys. In nearly all river valleys there are alluvial deposits in which the water extends laterally from the main stream and some water courses have water only in the sands and gravels of their beds for the greater part of the year.

Waters present various conditions underground, in some cases flowing to lower levels, through permeable rocks, caverns in limestone, or crevices in the harder rocks, to emerge as springs in hillsides, valley bottoms, or even out under the ocean, as off the east coast of Florida. Usually the water supply fills an underground reservoir of sand, gravel, porous sandstone, decomposed crystalline rock, or fissures. Water under this condition is usually designated "ground water" and its surface level is known as

similar but the water at *D* escapes in springs, so there is a constant flow from *C* toward *D*. On account of this flow to a lower level there is gradual diminution of "head" of the water from *C* to *D*, known as the "hydrostatic grade." This condition is found in the Central Great



FIG. 2.

Plains of the United States, where there is a bed of porous sandstone with an average thickness of 200 feet, underlying more than 500,000 square miles and in places lying 5,000 feet deep, but apparently filled with water throughout. Many wells draw artesian supplies from this sandstone and in some areas the flows have a surface pressure of over 200 pounds to the square

A

FIG. 1.

the "water plane." In some cases ground water may occupy strata or follow down crevices, for a depth of several hundred feet. Waters which extend far underground are mainly contained in sandstones and some of these water-bearers are of vast extent and often descend to great depths. Two conditions which frequently exist are

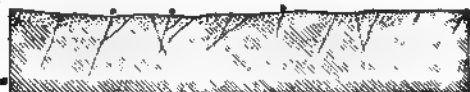


FIG. 3.

shown in the above cuts: Fig. 1. Cross-sections showing conditions of underground water in permeable strata. In these sections, a bed of sandstones reaches the surface at *A A* where it receives water from rainfall or sinking of streams. This water passes underground and an artesian basin is formed which would yield a flowing well at *B* and at other points where the land is less elevated than at *A* and *A*. In the second section, the conditions are somewhat

inch. Hundreds of billions of gallons are contained in this stratum. The rate of travel of underground water is slow, averaging about one mile a year in moderately porous sandstone.

In the accompanying figures are shown some conditions of underground waters which have been referred to above. Fig. 2.—Sections of a river valley, showing the relations of underground waters. This valley is cut in rock but partly filled with sand and gravel, as shown by the stipple. The river flows on the surface at *A* but the waters also flow slowly underground in an "underflow" and pass laterally into the sands, filling them to the "water plane" *B B* at the level of the river. Fig. 3.—Fissured and decomposed crystalline rock. Surface waters often sink deeply and occur in considerable volume under the conditions shown in this figure. *A* is the zone of decomposition and disintegration of the rock. *B B* are fissures down which the decomposition has progressed still deeper. This condition is found over wide areas in the Piedmont region of the southeastern United States.

N. H. DARTON,
United States Geological Survey.

WATERSHED — WATERTOWN

Watershed. See River.

Watertown, Charles, English naturalist: b. Walton Hall, Wakefield, 3 June 1782; d. 27 May 1865. He was educated at the Roman Catholic College at Stonyhurst, where he evinced a great taste for natural history. He spent many years in travel, and in 1825 published 'Wanderings in South America, the Northwest of the United States, and the Antilles in the years 1812, 1816, 1820, and 1824,' a book which has had great popularity. An illustrated and slightly altered edition was published under the direction of J. G. Wood in 1879. His only other publication is 'Essays in Natural History, with an Autobiography.' These appeared originally in three series (1838, 1844, 1857). In 1870 Norman Moore produced a new edition of them, together with some of his letters and a life. He lived a secluded life for many years at Walton Hall, where he formed a curious collection of animals.

Watertown, Mass., town in Middlesex County; on the Charles River, and on the Boston & Maine Railroad; eight miles west of Boston. It contains the villages of Bemis, Watertown, and Mount Auburn. It is connected with Boston and many of the suburban towns by electric railways. It was first incorporated in 1630. It has a number of manufacturing establishments, chief of which are woolen mills, hosiery works, starch factory, and needle factory. In 1900 (government census) the town had 105 manufacturing establishments, capitalized for \$4,549,242, and employing 2,304 persons, to whom was paid annually the sum of \$1,130,099. The cost of raw material used was \$3,811,808, and the value of the annual products was \$6,078,902. At the U. S. arsenal located here a large amount of modern ordnance work is being produced. The famous Mount Auburn (q.v.) Cemetery is in the town of Watertown. There are two banks, one national and one state. The national bank has a capital of \$100,000, and deposits amounting to \$300,000. The state bank (Watertown Savings Bank) has deposits amounting to \$1,256,660. Pop. (1910) 12,834.

Watertown, N. Y., city, county-seat of Jefferson County; on the Black River (about 10 miles from its entrance to Black River Bay, an arm of Lake Ontario), and on the New York Central & Hudson River Railroad (Rome, Watertown & Ogdensburg and Utica & Black River branches); about 90 miles northwest of Utica and 70 miles north of Syracuse.

Industries.—The city lies on both sides of the river, which here has a fall of 112 feet, producing a 16,500-horse-power. From Carthage, a village 16 miles above the city, to Dexter, eight miles below the city, the river is lined with busy manufacturing villages, all of which contribute in some measure to the prosperity of Watertown. Along this 24 miles of frontage, the investment in paper mill plants alone is over \$7,000,000, and the daily output from the mills is 440 tons. About 2,000 persons are engaged in the paper industry. In the city, besides the many paper mills, other large manufacturing are four carriage works, whose products are shipped all over the world; the Bagley-Sewall Company, manufactory of vises and paper machinery, portable steam-engine works, two large silk mills, running many looms and turning out an excellent product; two thermometer works; one factory producing chemical

and scientific instruments; lock and brass works, plow factory, and pump factory. The air-brake works, which has a thriving branch in Russia, having outgrown its original quarters, purchased several hundred acres of land on the north side of the river, and built shops that will accommodate many thousands of workmen. A city of mechanics' homes is growing up around the works. Watertown has two large flour mills which cater to the wholesale trade; one of the mills manufactures health foods, which are shipped all over the United States and to many foreign markets. According to the United States census of 1900, within the city limits, in the manufacturing establishments, there were employed 4,017 persons, who received annually, for their services, over \$2,100,000. The raw material used each year cost \$4,152,444, and the value of the finished products was \$7,881,977. The manufacturing plants were then capitalized for \$8,281,845. These figures apply to the industrial establishments within the city limits in 1900. Since then the city limits have been extended, many new manufacturing have been established, and nearly all the old plants have been enlarged, so that by 1911 the number and value of the city's manufacturing and products are greatly in excess of 1900.

Trade.—Watertown is the commercial and industrial centre of a large rich agricultural region, and it has an extensive wholesale trade in all kinds of merchandise. It is the distributing centre for a large number of towns and villages. The principal shipments are the products of its manufacturing and farm and dairy products. In 1903 over 200,000 boxes of cheese were sold in the city for about \$1,250,000. It has direct shipping connection with all the cities and villages within 100 miles, and with the Lake Ontario ports.

Buildings and Municipal Improvements.—The mercantile blocks of the city are built around a large parallelogram, and on five of the most important streets. This parallelogram is adorned with parks, a fountain, and a soldiers' monument. Some of the prominent public buildings are the government building, State Armory, opera-house, the banks, and several of the business blocks. The city has 49 miles of water-pipe, 400 hydrants, a daily consumption of 3,500,000 gallons of water, a pump capacity of 6,000,000 (average water pressure, 60 pounds per inch), and a reservoir capacity of 5,000,000 gallons. A filter, at a cost of \$100,000, was completed in the year 1904. Watertown has an area of seven square miles, 70 miles of streets, and is lighted by gas and electricity. There are two hospitals; the City Hospital, to which new buildings are constantly being added, and the Saint Joachim. The latter is conducted by Sisters of Mercy. There are two orphanages, and the Henry Keep Home, a refuge for the aged. The bureau of charity and the supervisor of the poor department are most efficient departments. A beautiful park crowns and overlooks the city. It covers about 600 acres, upon which for several years there has been an annual expenditure of \$75,000. The name of the donor has not been made public. The city's mean temperature, in summer, is 65° F and in winter 20° F.

Churches, Schools, Libraries.—The city has 23 churches valued at over half a million; Trin-

WATERTOWN — WATERVLIEF

ity, Protestant Episcopal, cost \$150,000; Holy Family, Roman Catholic, \$100,000. There are 11 school buildings valued at \$377,250; the high school cost \$100,000. The high school was established in 1869. The public school teachers number 112, the number of pupils enrolled, in 1903, was over 4,000. Other educational institutions are Immaculate Heart Academy, private business schools, and several school libraries. The Flower Memorial Library, a modern building, is the gift of Mrs. Emma Flower-Taylor, in honor of her father, Roswell P. Flower (q.v.). The building is white marble and cost \$200,000.

Banks.—Watertown has seven banks, five national and two state. The national banks have a combined capital of \$571,240, and the deposits in the seven banks amount to more than \$10,000,000.

Watertown was settled in 1800 by H. Coffen and Zacharia Butterfield. It was incorporated 5 April 1816, and chartered as a city in 1869. Pop. (1880) 9,883; (1890) 14,725; (1900) 21,606; (1910) 26,730.

Consult: 'Stafford's Gazetteer' (1813); 'The Gazetteer of New York' (1836); Hough, 'History of Jefferson County'; Skinner, 'Watertown'; Evert, 'History of Jefferson County'; 'Jefferson County Gazetteer'; Haddock, 'Centennial History of Jefferson County'; Emmerston, 'Jefferson County' (1898).

R. A. OAKES.

Watertown, S. Dak., city, county-seat of Coddington County; on the Big Sioux River, and on the Chicago & Northwestern, the Minneapolis & Saint Louis, the Burlington, Cedar Rapids & Northern, the Chicago & Northwestern, and the Great Northern R.R.'s; about 100 miles north by west of Sioux Falls. It is in a fertile agricultural region, in which the chief product is wheat. Stock-raising is given considerable attention. The city has flour mills, machine shops, large grain elevators, and stock-yards. It has an extensive trade in grain and live-stock. About three miles from the city is Lake Kampeska, one of the beautiful bodies of water of the State. There are eight churches, a public high school, and graded elementary schools. The three national banks have a combined capital of \$125,000 and deposits amounting to \$819,100. Pop. (1910) 7,010.

Watertown, Wis., city in Jefferson and Dodge counties; on the Rock River, and on the Chicago, Milwaukee & Saint Paul and the Chicago & Northwestern R.R.'s; about 44 miles west of Milwaukee and 38 miles east of Madison, the capital of the State. It is on both sides of the river, and has considerable water-power, which is utilized by various manufacturing establishments, chief of which are a large shoe factory, flour mill, foundry, machine shops, brewery, cigar factories, box factory, furniture factory, and creameries. In 1900 (government census) the city had 86 manufacturing establishments, capitalized for \$1,776,312. The value of the annual products was \$1,625,982. Watertown has several educational institutions, chief of which are College of Our Lady of the Sacred Heart (R. C.), Northwestern University (Lutheran), a high school, three large public schools, two parish schools, and a free public library. The three banks have a combined capital of \$275,000 and deposits amounting to over \$1,100,000. The gov-

ernment is vested in a mayor and a council of 14 members, elected biennially.

Watertown was first settled by Timothy Johnson, in 1836, and was incorporated in 1837. In 1853 it was chartered as a city. Pop. (1910) 8,829.

JAMES W. MOORE,
Editor 'Gazette.'

Waterville, Maine, city in Kennebec County; on the Kennebec River, and on the Boston & Maine Railroad; about 17 miles north by east of Augusta and 78 miles northeast of Portland. It was settled about 1760 by emigrants from Cape Cod, and was part of Winslow until 1802, when it was set off as a town and incorporated. In 1873 West Waterville was set off from Waterville, and in 1888 the city charter was granted. The Wakefield & Fairfield and the Waterville & Oakland electric railways connect the city with all the near-by places. The Ticonic Falls furnish some of the water-power used by the manufactories. The chief industrial establishments are the cotton mills, which have 1,100 employees; railroad shops, 300 employees; woolen factories, 500; and shirt factory, 150. There are about 300 men in the employ of the railroad as train and yard men, and a total of about 500 employees in a number of the small manufactories. In 1909 (government census) the total number of employees was 1,890. There were 33 manufactories, capitalized for \$4,762,000, which produced each year finished products amounting to \$3,179,000. There are nine churches, Colby College (Baptist), founded in 1818, Coburn Classical Institute, Ursuline Academy (R. C.), a public high school, public and parish elementary schools, and school libraries. The four banks have a combined capital of \$500,000. The Waterville Savings Bank has deposits amounting to approximately \$1,200,000. The government is vested in a mayor, seven aldermen, and 14 councilmen, elected annually. There are a number of French Canadians, but the majority of the inhabitants are native born. Pop. (1890) 7,107; (1900) 9,477; (1910) 11,458.

THOS. F. MURPHY,
Editor 'Sentinel.'

Waterville, N. Y., village in Oneida County, on the Lackawanna Railroad; about 22 miles southwest of Utica. It is in an agricultural region in which hops and vegetables are the chief products. It has steam grist mills, wood-work factory, and shoe factory. The principal public buildings are the Granger and Masonic halls, the Y. M. C. A. building, and the churches and schools. There are six churches, a high school established in 1872, public graded schools, and a public library. There are two banks; the national bank has a capital of \$150,000. Pop. (1910) 1,410.

Watervliet, wá-tér-vliet', N. Y., city in Albany County; on the Hudson River, the Erie Canal, and the Delaware & Hudson Railroad; opposite Troy and four miles north of Albany. It is connected with Albany by steam and electric railways, and thus with the New York Central & Hudson River Railroad. It is connected with Troy by an iron bridge, over which pass electric cars for both passengers and freight, and by regular ferry-boats. It is at the head of river navigation and has, by means of the Hudson River, water connections with New York and intermediate points, and by means of Erie

WATERWAYS OF THE UNITED STATES

Canal with the interior of the State and with Lakes Ontario and Erie ports.

Industries.—Watervliet is a manufacturing city. In 1900 (government census) there were 135 manufacturing establishments, which were capitalized for \$1,826,691 and which employed 1,167 persons. The value of the yearly products was \$1,809,241. It has manufactories of woolen goods, bells, iron products, sashes, doors, and blinds, metal harness parts, street cars, car-journal bearings, machine-shop products, and scales. In 1807 the U. S. government established here the Watervliet Arsenal, one of the largest plants for the construction of siege ordnance and field and coast defense belonging to the United States. The arsenal is on a reservation of 100 acres, which has a wharfage, on the Hudson, of 1,000 feet. The usual manufactures for use in war are produced here, as shot and shell, small ammunition, gun-carriage equipments, etc. There are two large stone magazines. On the reservation are quarters for the officers and barracks for the soldiers and also for any civilians who may be employed in the works. There is also a hospital. During the Mexican and the Civil wars there were about 1,500 persons employed, who worked in relays, day and night, preparing materials for the U. S. army. Since 1892 some of the largest guns in the U. S. service have been made here, and the construction works have been constantly in operation on the large guns and necessary equipment required for the army and navy and for coast defenses.

Churches and Schools.—There are 10 churches representing six different denominations; a high school established in 1899, Saint Patrick's Academy, four public schools, four parish schools, a Union Free Library, and a high school library. There is a graded school in connection with Saint Colman's Orphanage.

History.—Watervliet was settled about the time when settlements were made at Albany and other places on the Hudson. It was incorporated as a village, and called West Troy in 1836. In August, 1837, it was chartered as a city under the name of Watervliet. Its industrial growth has been closely connected with the work of the government arsenal. It has many of the social and educational advantages of Albany and Troy. Pop. (1910) 15,074.

Waterways of the United States. The atlas of the world shows that three fourths of its surface is covered with water. The waters of the earth comprise oceans, seas, gulfs, bays, lakes, and rivers. In the main these are navigable, but where not navigable, much has been done to make them so. In addition thereto, extensive systems of intersecting canals have been constructed, so that natural and artificial waters of the world, known as "waterways," comprise all its oceans, seas, gulfs, bays, many of its lakes and rivers, and all navigable canals.

In the United States the ebb and flow of the tide is not the test of navigability, as it was in England before it was abolished by 24 Vict., ch. 10. The Supreme Court of the United States held in the *Daniel Ball*, 10 Wall. 557, that a different test than tidal variations must be applied here to determine navigability. The court say that those rivers must be regarded as public navigable rivers in law, which are navigable in fact; and they are navigable

in fact when they are used, or are susceptible of being used, in their ordinary condition, as highways for commerce, over which trade and travel are or may be conducted in the customary modes of trade and travel on water. The commercial power of Congress authorizes such legislation as will insure the convenient and safe navigation of all navigable waters of the United States, whether that consists in requiring the removal of obstructions to their use, in prescribing the form and size of the vessels employed upon them, or in subjecting the vessels to inspection and license. The power to regulate commerce comprehends the control for that purpose and to the extent necessary, of all navigable waters of the United States which are accessible from a state other than those in which they lie. For this purpose they are the public property of the nation, and subject to all the requisite legislation of congress. Recently in *Perry v. Haines*, 191 U. S. 17, the same court decided that admiralty jurisdiction extends to cases of maritime liens upon vessels navigating the Erie canal, as that formed part of a navigable highway for interstate commerce between Lake Erie and the ocean. Thus artificial as well as natural navigable waters are being recognized as public waters in the sense in which Bracton used that term in the rule that *publica vero sunt omnia flumina et portus*. Years ago the English courts decided that the river Severn was a public highway, and the courts of this country have followed the decisions of the Supreme Court of the United States heretofore stated in regard to public navigable waterways. An interior nation has a servitude along natural water courses to reach the highway of nations, known as *jus transitus*, which is recognized by the law of nations. The right of transit over the Danube below the Iron Gates is secured by agreement. In the United States and in Canada, the rivers do not generally flow in foreign territory, so that it is not necessary to invoke the doctrine of *jus transitus*, except in a few cases, as along the Richelieu and lower Saint Lawrence.

The waterways of Maine include 240 miles of seacoast, with many bays indenting it and scores of islands strewn along it. The Saint Croix River on the east is the outlet of Grand Lakes. The Penobscot is 275 miles long and navigable to Bangor by large vessels. It is the outlet of several lakes in central Maine and flows into Penobscot Bay, 30 miles long and 15 miles wide. The Kennebec is 160 miles long and navigable to Augusta. It is the outlet of Moosehead Lake, which is 36 miles long and from 8 to 12 miles wide, and navigated by pleasure steamers. The Androscoggin River drains the famous Rangeley lakes and other lakes, and flows 200 miles into the Kennebec near its mouth. It is navigable only in part and by river craft. Sebago Lake is 12 miles long and 10 miles wide and navigable by small steamers. The principal seaport, Portland, has large commerce and there are several ship yards along the coast. New Hampshire has but little sea-coast and no navigable rivers. Those parts of the Merrimac and Connecticut which pass through New Hampshire are not navigable, except by small river craft and by rafts. The inland lakes of New Hampshire are navigable by small pleasure boats. The same is

WATERWAYS OF THE UNITED STATES

true of the rivers of Massachusetts. It has, however, Boston Harbor, Massachusetts Bay, Cape Cod Bay, which is to be connected with the Atlantic by a canal across Cape Cod, Nantucket Sound, Vineyard Sound, Buzzard's Bay, and several other small bays, all in communication with the ocean. Taunton River is navigable to Taunton, 12 miles from its outlet, which empties into Mount Hope Bay. The Mystic and Charles rivers are navigable at their mouths only. Salem, as a commercial port, has a reputation far more enviable than that for withcraft.

Vermont has part of Lake Memphremagog, which is navigable by lake steamers, and part of Lake Champlain, 120 miles long and 15 miles wide in its extreme width, which has been, since its discovery on 4 July 1609, a highway of commerce for the aborigines, for the colonists, and for Americans generally. It is navigated by large lake steamers, by scores of other steamers, and by many yachts and sailing vessels. It is one of the most picturesque lakes in America and forms an important portion of the 467 miles of waterway between the Saint Lawrence on the north and New York Bay on the south. It contains several beautiful islands such as Isle La Motte, North Hero, and South Hero. Lake Champlain is to be connected with the waters of the Hudson River at Fort Edward by the improved Champlain Canal, having a depth of 12 feet of water, so that vessels drawing 10½ feet may pass from Lake Champlain through into the Hudson River. This will greatly increase the commerce on the lake.

Rhode Island has Narragansett Bay, Mount Hope Bay, Providence and Sakonnet rivers. These are navigable and are frequented by some of the best equipped vessels in America and by hundreds of pleasure boats. The merchant marine of the ports of Rhode Island in 1903 comprised 88 vessels of 15,835 tons. Connecticut has part of Long Island Sound, the Thames River, navigable to Norwich, the Connecticut River, navigable to Hartford, the Naugatuck River, navigable by small craft for a few miles and the Housatonic, 150 miles long and navigable to Shelton. It has several towns along its waterways, such as Stonington, Norwich, New London, New Haven, and Bridgeport. Long Island Sound is 110 miles long and 20 miles wide. It is a great waterway for several superb steamboat lines plying between New York and towns and cities on its northern shore. The Connecticut River at one time was navigated by a number of river boats and had considerable commerce. A line of boats ran between Wells River, Vt., and Hartford. The boats were flat boats and did not draw much water. The Barnet was the first steamer for Connecticut River service. It drew 22 inches of water. On its first trip from Hartford to Vermont it had in tow a barge filled with people. Other steamers were built for river service, in which they were engaged for many years. This river was a great natural highway for the transportation of produce to market. The rapids in the river were overcome by canals at South Hadley Falls, at Turner Falls, and at Bellows Falls.

The waterways of New York comprise that portion of the Atlantic Ocean washing Long Island on the south, and that part of Long Island Sound washing Long Island on the north, and also the upper and lower New York

bays, and a portion of Staten Island Sound, and all of the East, Harlem, and Hudson rivers. New York is the largest commercial port in the western hemisphere, and the second largest commercial port in the world, it being exceeded only by London. The total tonnage that entered that port in the year ending 30 June 1903, was 9,053,906 tons, and its clearances amounted to 8,847,072 tons, that being about one half of the entire tonnage of all the Atlantic ports for that year. Its unique position at the confluence of the East and Hudson rivers overlooking one of the finest harbors in the world, has added to its other commercial advantages and is destined to continue it as the emporium of the western hemisphere. On the north flows the picturesque Hudson, discovered in September 1609, and navigable by steam vessels 150 miles to the city of Troy, and by canal barges to Waterford. It is to be canalized from Waterford to Fort Edward. It receives on the west the waters of the Mohawk formerly navigable about 95 miles, to Little Falls, which is also to be canalized from the Hudson nearly to the city of Rome. The canalized Hudson and Mohawk are to form a part of the improved canal system of the State of New York, about to be constructed pursuant to the provisions of the Canal Referendum Law introduced in the Senate of the State of New York in the session of 1903 by Senator George A. Davis, chairman of the canal committee of the Senate, which law provides for the issue and sale of the bonds of the State, amounting to \$101,000,000, for the construction of a system of barge canals, having a bottom width of 75 feet and a depth of 12 feet, from the waters of the Hudson to those of Lake Champlain, Lake Ontario, and Lake Erie, adequate for barges carrying 1,000 tons. This law received the phenomenal popular approval of 245,000 majority in the State at the general election in 1903. This is the largest canal improvement project ever undertaken by one of the American States, and one of the largest ever undertaken in the history of the world. West of the city of Rome is Oneida Lake, into which flows Wood Creek, which is to be canalized and connected with the Mohawk. Oneida Lake, Oneida River, and Oswego River are all to be canalized, as well as the Seneca River from the Three River point to the outlet of Onondaga Lake, and thence southwesterly nearly to Seneca Lake. New York contains several beautiful bodies of water, such as Lake George, part of Lake Champlain, part of Lake Ontario, part of Lake Erie, Onondaga, Skaneateles, Cayuga, Seneca, Keuka, Canandaigua, and Chautauqua Lake, all navigable by steamers. Seneca Lake formerly had a large commerce, which undoubtedly will be revived by improving its outlet and forming a connection with the new 1,000-ton barge canal. It has also been proposed to improve the outlet of Cayuga Lake in a similar manner. All of these lakes are navigated by passenger steamers during the summer months. The waterways of New Jersey comprise a portion of the lower Hudson, upper New York Bay, Newark Bay, Staten Island Sound, Raritan Bay, the Atlantic Ocean and several arms of the ocean indenting the eastern coast of New Jersey, and Delaware Bay on the south, and the Delaware River on the west, and other rivers intersecting it. These

WATERWAYS OF THE UNITED STATES

are all navigable. The Delaware River on the west is between 300 and 350 miles long, and extends the entire length of its western border, dividing it from the States of Pennsylvania and Delaware. It is navigable to Philadelphia by ocean steamships, and to Trenton by ordinary river vessels. The Raritan River is navigable from Raritan Bay to New Brunswick, and from that point along the bed of the Raritan and Millstone rivers to Trenton is a canal, thus joining the waters of lower New York Bay with those of the Delaware. The total length of the Susquehanna River, including tributaries, is over 400 miles, and it is only partially navigable. It flows into the Chesapeake Bay, which is 170 miles long and 50 miles wide. The Delaware and Chesapeake bays are connected by a canal of 10 feet draft. In some portions of its course the Susquehanna has been canalized to overcome rocks and vegetable matter, which obstructed its navigation. Pennsylvania has suffered its extensive canal system to pass from its control. The Potomac River is about 400 miles long and navigable 125 miles for large vessels. It flows into the Chesapeake Bay from the northwest. It receives from the south the waters of the Shenandoah. The Rappahannock River is over 200 miles long and navigable for about 60 miles. The James River is 450 miles long and navigable as far as Richmond. The Roanoke River is 450 miles long and navigable to Weldon. The Roanoke flows into Albemarle Sound, which is about 50 miles long and from 5 to 8 miles wide, and it communicates through Croatan Sound with Pamlico Sound, which is 75 miles long and about 20 miles wide. Both of these sounds are connected with the Chesapeake by the Chesapeake and Albemarle Canal, having a depth of 11½ feet and doing an active business.

The sounds are shallow and communicate with the Atlantic Ocean. Into Pamlico Sound flows the Pamlico and the River Neuse. The Savannah River, whose length including tributaries is 550 miles, is navigable by large vessels to Savannah, and by small vessels to Augusta. The Great Pedee River is navigable 150 miles and flows into the Atlantic Ocean. The St. John's River in Florida is navigable for steamers 150 miles, and small vessels go 150 miles further up. It connects several lakes, some of which communicate with the ocean. The Suwanee River is 250 miles long and navigable in its lower course. The Apalachicola River is 90 miles long and is navigable in its lower course. The Tallapoosa River, 250 miles long and navigable for 40 miles, and the Coosa, 350 miles long, unite to form the Alabama River, 8 miles west of Montgomery. The Alabama River is 350 miles long and navigable from the junction of these two rivers to the Mobile. The Tombigbee, 450 miles in length, unites with the Alabama to form the Mobile, which flows into Mobile Bay and is navigable to Aberdeen in Mississippi. The Tombigbee receives the waters of the Black Warrior River, which is 300 miles long, and navigable to Tuscaloosa. The Mobile River is 45 miles long, and Mobile Bay is 36 miles long and its width is about 10 miles. There are many small lakes in the interior of Florida, which communicate with the Atlantic Ocean. Many other lakes in Florida are connected by rivers and

canals. One of the largest of these is Lake Okeechobee, which is connected by canal and river with the Charlotte Harbor, on the west coast of Florida. There are many bays and inlets indenting the sea-coast from Florida to Mexico. Among the largest of these are Tampa Bay, Choctawhatchee Bay, Perdido Bay, Pensacola, Mobile, Lake Pontchartrain, Lake Borgne, and Mississippi Sound, Timbalier Bay, Cerrebonde Bay, Atchafalaya Bay, Vermilion Bay, Côte Blanche Bay, Sabine Bay, and Galveston Bay.

The Mississippi River, which empties into the Gulf of Mexico, is navigable as far as Saint Paul, a distance of about 2,000 miles, by vessels of moderate draft. It has several large tributaries. On the east is the Yazoo, 280 miles long, and navigable 240 miles. The largest tributary on the east is the Ohio. It is 1,100 miles long and from ½ to ¾ mile wide, and is formed by the union of the Allegheny and Monongahela rivers, and is navigable by vessels drawing six feet of water. Dams have been constructed at 38 different points in the river between Pittsburg and Cincinnati to raise the water levels in the intervening sections. The dams are passed by locks 600 feet long and 110 feet wide, having a depth of 6 feet of water. The Monongahela River is navigable for upward of 100 miles above its confluence with the Allegheny by large river craft, and for a distance of 50 or 60 miles further by small river craft. The Allegheny River is navigable from Waterford near French Creek and 15 miles from Lake Erie to its outlet at Pittsburg. The Ohio River has several tributaries, such as the Kenanas, Beaver, Muskingum, Sandy, Scioto, Miami, the Licking, the Kentucky, the Salt, Green, Wabash, Cumberland, and Tennessee. The Muskingum is 240 miles long, navigable 95 miles. The Scioto is 250 miles long and navigable 130 miles. The Kentucky is 250 miles long, navigable to Frankfort. The Wabash is 550 miles long, and receives as a tributary on the east the White River. The Tennessee, with its longest tributary, the Holston, is over 100 miles long, and is navigable the greater part of its length. The Cumberland is over 600 miles long and is navigable to Nashville, nearly 200 miles. The tonnage passing down the Ohio River in 1902 was 1,472,575 tons, consisting of coal, steel rails, lumber, sugar, and molasses. There are about 40,000,000 bushels of coal shipped annually from Pittsburg down the Ohio River. In the development of this country the Ohio River was one of the great highways over which the tide of civilization passed westward. Saff boats have given way to barges and steamboats, and the commerce of the Ohio and its tributaries is increasing from year to year, and the number of vessels on the Mississippi and on the Ohio is estimated to be more than 4,000, which annually enter the port of New Orleans. A project is under consideration in Ohio for the construction of a system of canals from Lake Erie on the north to the Ohio River on the south, involving an enormous outlay of money, rendering such canals navigable for barges of 500 tons capacity and upward. The next tributary to the Mississippi on the east is the Illinois, which is 500 miles long, navigable for 245 miles, and receives the waters of the Kankakee and the Desplaines, which latter river has been in part

WATERWAYS OF THE UNITED STATES

canalized and in part paralleled by the Chicago Drainage Canal, 28.05 miles long, 22 feet deep, and 110 feet wide on the bottom, to the south branch of the Chicago River, which communicates through the north branch with Lake Michigan. These form a continuous waterway from the Mississippi River through to Lake Michigan at Chicago. The Chicago Drainage Canal has been made navigable for vessels drawing 22 feet of water, and has the largest prism of any canal of its length in the country. In 1848 the Illinois and Michigan Canal was completed, having a length of 96 miles and a depth of 6 feet, and extending from Chicago to La Salle. Congress authorized the survey for the Hennepin Canal in 1882, connecting the waters of the Illinois River at Hennepin with those of the Mississippi at Rock Island. The Mississippi also has the Wisconsin River as a tributary on the east, which is 600 miles long and navigable up to Portage City, where it connects by a canal with the headwaters of the Fox River in Wisconsin. It flows westerly into the Mississippi. The Fox River, 200 miles long, flows northeasterly through Lake Winnebago into Green Bay. It is navigable. These two rivers and canal form a continuous waterway from the Mississippi to Lake Michigan, which has been declared by the courts a public highway. Through the Wisconsin and Fox rivers steamers may pass from the Mississippi into Lake Michigan. This is one of the three waterways mentioned in Smith's 'History of Wisconsin,' which connect the waters of the Mississippi with those of the Saint Lawrence, the other two being the Illinois and Desplaines rivers and the Miami of the Lakes. The next tributary of the Mississippi on the east is the Saint Croix River, which is navigable for 60 miles. The upper Mississippi is navigable between Saint Anthony's Falls and the Sauk Rapids. The Mississippi River drains several lakes in the central part of Minnesota. The first tributary on the west is the Minnesota, 450 miles long, and navigable to Patterson's Rapids, a distance of 295 miles. The Minnesota River drains Big Stone Lake and Lake Traverse, into which latter lake flows the Red River of the North, which is 700 miles long. The next tributary to the Mississippi is the Des Moines River, 500 miles long, navigable to the city of Des Moines. The next tributary is the Missouri River, which with one of its principal tributaries, the Madison, is over 3,000 miles long, and is navigable for shallow vessels to Fort Benton on the Madison, 2,682 miles. The channel of this river changes so frequently that its navigability is seriously interfered with. The Missouri receives on the east as tributaries the river James and the Big Sioux. On the west the Little Missouri and the Yellowstone, which latter river is over 1,000 miles long and navigable to the mouth of the Big Horn. The Yellowstone River drains the Yellowstone Lake. Other tributaries of the Missouri are the Green River, the Owl, the Big Cheyenne, the White, the Niobrara, all lengthy, but none of them navigable. The Nebraska or Platte, formed by the North and South Fork, and including the North Fork 1,000 miles long, and the Kansas River, including Smoky Hill Form, 900 miles, are all lengthy tributaries of the Missouri, but are not navigable. Congress has been asked to make appropriation, however, to render some of these

lengthy rivers navigable for commercial purposes. The next tributary to the Mississippi on the west is the Saint Francis River, 450 miles long, navigable 80 miles. The next is the White River, 800 miles long and navigable 175 miles to Batesville. The next large tributary to the Mississippi is the Arkansas, 2,000 miles long, and navigable for 800 miles. It has several large tributaries, the most important of which is the Canadian, 900 miles long, and having a tributary, the North Fork, 600 miles long. Another long tributary of the Canadian is the Cimarron. The waters of the Arkansas supply large irrigating canals in Colorado. There are many irrigating canals supplied by the waters of this and other rivers in the vicinity of the Rocky Mountains. The next tributary to the Mississippi is the Red River, 1,200 miles long, and navigable to Shreveport. It has two tributaries on the north, the Washita and the False Washita.

The river Calcasieu, in Louisiana, 200 miles long, flows into Calcasieu Lake, and that empties into the Gulf of Mexico. This river is only partially navigable. Both the river Sabine, 500 miles long, and the River Neches, 350 miles long, flow into Sabine Lake, and that empties into the Gulf of Mexico. The Trinity River in Texas is over 500 miles long, and navigable about half its length. It flows into Galveston Bay, which is 35 miles long, and affords one of the best harbors in the Gulf of Mexico, from which great quantities of produce are exported. The Brazos River is over 900 miles long, navigable over 200 miles, and flows into the Gulf of Mexico. The Colorado River is 900 miles long and navigable during certain seasons of the year as far up as Austin. This river empties into Matagorda Bay. The Guadalupe and the San Antonio rivers are both about 200 miles long, and the Nueces is about 400 miles long, and all flow into bays on the coast of Texas. These rivers have many small tributaries that are not navigable. The Rio Grande is the largest river next to the Mississippi flowing into the Gulf of Mexico. It is 1,800 miles long and navigable by small craft about 450 miles to Kingsbury Rapids. The Colorado River flows into the Gulf of California, is 2,000 miles long and navigable 612 miles. Its largest tributary is the Gila, about 650 miles long. The Sacramento River flows into San Francisco Bay, which is 40 miles long and 12 miles wide, and affords one of the best harbors in the world. On the north in connection with it is San Pablo Bay, which is only 18 feet deep, and into which through the Straits of Karquines flows the Sacramento River. The Sacramento is 500 miles long. Its largest tributary is the San Joaquin, which is 350 miles long, and navigable for large steamers to Stockton, and for small steamers about two thirds of its course. There are other small rivers flowing into the Sacramento from the east.

Improvements undertaken by the general government and the State of California have opened up the Lower Sacramento and connecting waters until the range of tidal action has been extended as far up as Sacramento City, and rendered it navigable for vessels drawing from 10 to 15 feet of water. The Columbia River is about 1,400 miles in length, and flows into the Pacific through a wide mouth, upon which is located Astoria. Upon this river are

WATERWAYS OF THE UNITED STATES

located important salmon fisheries. It is navigable 165 miles to the first Cascade, and above these it is navigable on another level for about 50 miles to the second Cascade, and above those it is navigable for small vessels for a considerable distance further. It has several navigable tributaries. Among these is the Willamette in Oregon, 280 miles long, navigable to the falls at Oregon City, and above them to Eugene City. It receives on the east as a tributary the Snake River, 1,100 miles long, navigable to Lewiston. In Washington there are several bodies of water, such as Lake Chehalis, navigable for small pleasure boats. On the northwest in Washington, communicating with the Strait of Juan de Fuca is Puget Sound, setting far into the interior of the State of Washington. It is about 80 miles long, and is divided into two or more channels. On the easterly shore are located Seattle and Tacoma, and on the south, Olympia. It affords one of the best harbors on the Pacific coast. There are many rivers flowing into the Great Lakes, most of which are not navigable. Among such, however, as are navigable are the Fox River in Wisconsin, already described, which flows into Green Bay, which is 115 miles long and 15 miles wide, and has an extensive commerce. The Grand River in Michigan has been declared to be a public navigable waterway between Grand Rapids and Grand Haven. It flows into Lake Michigan and is over 230 miles long, and is navigable to Grand Rapids by steamers of 120 tons burden. The Saint Joseph River, which flows into Lake Michigan, and is 250 miles long, navigable for about half its length. The Chicago River, a waterway navigable for large lake vessels within the city of Chicago and one of its branches now forms a part of the waterway connecting Lake Michigan with the Mississippi. Between the United States and Canada are five great lakes, constituting together the largest freshwater bodies in the world. Lake Superior on the west is the largest of these, being 412 miles long and has an average width of 70 miles, but its maximum width is 167 miles. It is over 475 feet deep and receives the waters of many small rivers flowing into it. Lake Superior flows, through St. Mary's River, about 50 miles long, into Lake Huron. The United States government has constructed a ship canal to overcome rapids in this river, which is 1 1/4 miles long, 100 feet wide, with a minimum depth of 22 feet of water. The Canadian government has also constructed a canal 1 1/4 miles long, 150 feet wide, with a lock 900 feet long, and 60 feet wide, with a minimum depth of 22 feet. The volume of tonnage through these two canals in the year 1903, was 34,674,437 net tons, and the number of vessel passages was 18,996; and the aggregate freight charges on such tonnage for its entire transit was \$26,727,735. Three quarters of such tonnage was from Lake Superior to other lake ports, and less than one quarter was from other lake ports to Lake Superior ports. The number of passengers on boats passing the locks during the season was 55,175. The cost per ton per mile for carrying such freight averaged 90-100 of a mill, which is very low freight rate. It is estimated that the entire tonnage of the Great Lakes was approximately 55,000,000 tons, for the year 1903. South of Lake Superior lies Lake Michigan,

whose length is 320 miles, its average width is 65 miles, and it has an average depth of 385 feet. Lake Michigan flows through the Straits of Mackinac, 30 miles long and 16 miles wide, into Lake Huron, which is 363 miles long and 101 miles wide, and has a prolongation on the east known as Georgian Bay, wholly in the Dominion of Canada, and 120 miles long and 40 miles wide. Lake Huron flows through the Saint Clair River, 35 miles long and 1 mile wide, into Lake Saint Clair, which is 19 miles long and 25 miles wide. Lake Saint Clair flows into the Detroit River which is 25 miles long, and flows into Lake Erie. Lake Erie is 250 miles long, from 40 to 60 miles wide, and barely exceeding 100 feet in depth. Into Lake Erie flows the Maumee River, 200 miles long, navigable in its lower course, but paralleled by a canal extending across the State of Ohio. It also receives the Sandusky River, which flows into Sandusky Bay, which is 20 miles long and about 4 miles wide. The Sandusky River is about 125 miles long. The Cuyahoga River also flows into Lake Erie. It is between 80 and 90 miles in length and is paralleled by a canal extending across the State, but not in operation. Lake Erie empties into the Niagara River, which is about 34 miles long and 3 mile wide, and whose navigability is interrupted by the Cataract at Niagara Falls and the Whirlpool and other rapids below the Falls as far as Lewiston. A project is under consideration in Congress to construct a 22-foot ship canal from Lake Erie through the Buffalo Harbor to a point in the Niagara River below the city of Buffalo, in order to permit lake vessels of large draft to descend the river to Tonawanda. The traffic on the Niagara River to Tonawanda consists principally of lumber and iron ore. Excursion steamers navigate the Niagara within three miles of Niagara Falls, and Lake Ontario steamers ascend the lower Niagara as far as Lewiston. Niagara River flows into Lake Ontario, which is 190 miles long, 40 miles wide and has a depth of 300 feet. Lake Ontario empties into the Saint Lawrence River. The Genesee River flows into Lake Ontario, and also the Oswego and the Black. The Oswego River is to be canalized and made navigable its entire course for vessels carrying 1,000 tons. The Black River is about 200 miles long, and is paralleled by the Black River Canal in part of its course. There are several bays setting into the mainland from Lake Ontario on the south and east, such as Irondequoit, Sodus, Black River Bay, Chaumont, and Alexandria Bay, which communicates with the Saint Lawrence River, and is one of the most popular summer resorts. It has a large river commerce and many beautiful yachts frequent it during the summer months.

In northern New York are many beautiful lakes in the Adirondack region, such as Saranac, Tupper, Lake Placid, Honondaga, Fulton Chain, Chateaugay, Chazy, Clear Lake, and others. Most of these are navigated by small pleasure craft and are visited by thousands of people every year. In the Champlain Valley is Lake George, 36 miles long and from two to three miles wide. This is navigated by a line of steamers and is one of the most picturesque lakes in America. Its outlet is only five miles from Lake Champlain. Several small rivers flow into Lake Champlain and among

WATKIN—WATKINSON

these the Champlain River, the Missisquoi River and Otter Creek, which are navigable for five or six miles each for Lake Champlain vessels.

There are several hundred miles of artificial waterways in the United States, which were constructed for the purpose of navigation by vessels drawing from three to six feet of water and carrying from 75 to 300 tons of freight. Some of these have been abandoned and others have been permitted to be partially filled with silt and grown up with vegetable matter, while others have been kept in a state of good repair and active operation. At one time Pennsylvania had about 500 miles of navigable canals. The canals of Ohio, such as the Miami and Erie, the Ohio, the Walhonding and the Hocking were in active operation. All these artificial navigable waterways had an extensive commerce. The Erie, Champlain and Oswego canals of New York have carried from three and a half to six millions of tons of freight annually for upwards of 50 years. And they are now to be improved and enlarged so that they will have a maximum carrying capacity of 20,000,000 tons annually. The prism of these new canals will be 12 feet deep and 11 feet over mitre sills and have a bottom width of 75 feet. Their locks will be 328 feet long and 28 feet wide.

Alaska has its picturesque Yukon, 2,000 miles long and navigable for 1,200 miles. It has several tributaries such as the Porcupine River, Big Black River, the Birch River, the Tanana and other smaller rivers. Northeast of Bering Strait is Kotzebue Sound and southeast is North Sound. Both of these are on the western Alaska coast. South of the Yukon is Kuskokwim River, 450 miles long, and still farther south, along or near the coast, are Bristol Bay, Iliamna and Nikhakk lakes, Shelikof Strait, Cook Inlet, William Sound and Copper River, which is 150 miles long. Southern Alaska comprises several connecting waters into which flow Taku and Iskut rivers. All Alaskan waterways are navigable during the warm summer months only, but they serve an important function as a means of reaching the interior to the gold and mineral mines of that territory. Alaska has about 3,000 miles of sea coast and many gulfs, bays and straits, in communication with the Pacific Ocean. Its commerce is growing rapidly and many boats ply between its seaport towns and among its beautiful islands, extending from Chatham Sound and Portland Canal on the east to the farthest-most Aleutian island on the west.

HENRY WAYLAND HILL,

Chairman of the Committee on Commerce and Navigation of the Senate of the State of New York.

Watkin, wôt'kin, Sir Edward William, English railway manager: b. Northenden, Cheshire, 1819; d. London 14 April 1901. He was engaged in the warehouse of his father, a London merchant, from 1839-45, when he became secretary to the Trent Valley Railroad Company, and thenceforward continued in the railway business, becoming general manager and director in various leading companies. He was chairman of the Southeastern in 1867 and of the Metropolitan in 1872, extricating each from financial difficulties. While president of the Canadian Grand Trunk

he prosecuted negotiations which resulted in the confederation of the five British North American provinces. He was elected to Parliament for Great Yarmouth in 1857, but was unseated by petition. In 1864-8 he was member for Stockport, and for Hythe in 1874-95. He was knighted in 1868, and created a baronet in 1880. He was the chief promoter of the Channel tunnel project.

Watkins, wôt'kinz, John Elfrath, American scientist: b. Ben Lomond, Va., 17 May 1852; d. 1903. He was graduated from Lafayette College in 1871, and until 1872 was mining engineer for the Delaware & Hudson Canal Company. He was appointed curator of the United States National Museum in 1877, an office he occupied until 1892, and in 1895 became superintendent and curator of its technological collections. He wrote much concerning the development of railroad and telegraph systems, including: 'The Evolution of the Railway Passenger Car' (1888); 'History of the Pennsylvania Railroad, 1846-96' (1896), etc.

Watkins, N. Y., village, county-seat of Schuyler County; on Seneca Lake, and on the New York Central & Hudson River (Fall Brook) and the North Central R.R.'s; about 20 miles north of Elmira. It is in an agricultural region in which are large vineyards. The Glen Springs Sanitarium is a famous salt plant, but the chief attraction is the glen. The principal manufactures are flour and lumber mills, wagon and carriage factories, and iron foundries. Several mineral springs are near by. Large quantities of grapes are shipped in the season. The village has a high school, founded in 1863, graded schools, two libraries, and two private banks. Pop. (1910) 2,817.

Watkins' Glen, N. Y., near the village of Watkins, in Schuyler County, a ravine noted for its picturesque scenery and its great beauty. The rocks are Devonian shale, which, during the Pleistocene period, were cut into narrow gorges by the glacial ice. The gorge here is, in places, 300 feet deep, and a narrow stream flows through forming a succession of beautiful cascades and rapids. On the slope from the crest of the elevation overlooking a most charming part of the gorge, to the village of Watkins, is a cemetery, which for natural beauty is rarely equaled. The artist, Hope, made Watkins his home for many years, and he was laid to rest in the cemetery he so much admired. Many tourists visit the glen each year.

Watkinson, wôt'kin-sôn, David, American philanthropist: b. Lavenham, Suffolk, 17 Jan. 1778; d. Hartford, Conn., 13 Dec. 1857. He came with his parents to the United States in 1795 and was for a time engaged in a New York counting house. He established a business in Hartford with his brother William in 1800, and retired in 1841 with an immense fortune. His will bequeathed large sums to various charitable institutions and he also gave \$100,000 to the Connecticut Historical Society for a reference library.

Watkinson, William L., English Wesleyan clergyman: b. Hull, Yorkshire, 30 Aug. 1838. He became editor of the 'Wesleyan Methodist Magazine,' and of the London 'Quarterly Review,' and in 1897-8 was president of the Wesleyan Conference. He has published: 'Mistaken Signs' (1882); 'The Influence of Skepticism on

WATLALA INDIANS—WATSON

Character' (1886); 'The Transfigured Sackcloth' (1893); 'Studies in Christian Character, Work, and Experience' (1901); 'The Bane and the Antidote' (1902); etc. He has received degrees from American universities.

Watlala Indians, a tribe of the Chinookan stock of North American Indians, who call themselves Kwikwulit, and who have also been known as Upper Chinook, Wahlellah, "Dog River, or Cascade Indians," etc. They formerly occupied the Cascades and about Dog River, which discharges into the Columbia about midway between the Cascades and The Dalles, in Wasco County, Oregon. They numbered but 80 souls in 1854; in the next year they entered into the Wasco treaty, by which they agreed to move to the Warm Springs Reservation, where a few of them now are, while the others are still about the Cascades. Their language is almost identical with that of the Wasco (q.v.).

Watling (wōt'ling) Street, England, one of the great Roman roads, commencing at Dover, passing through Canterbury and Rochester to London, and thence to Chester and York, and north in two branches to Carlisle and the Wall in the neighborhood of Newcastle. Traces of the ancient road are still found in many parts of its course, and in some it is still an important highway; a street in London retains its name. It was the line of division in the treaty between Alfred and Guthrum the Dane, and it is still the boundary between Warwickshire and Leicestershire. Of the origin of Watling nothing is now remembered; it is supposed to be a corruption of Stratum Vitellianum; a trace also survives in the name Wattlesborough, a place on Watling street near Wroxeter (Uriconium).

Watlings (wōt'lingz) Island, one of the Bahamas, British West Indies, lying 220 miles northeast of Cuba. It is 18 miles long and has a lagoon near the centre. It is fertile, but sparsely inhabited. It is now generally admitted to be the first landing place of Columbus, called by him San Salvador.

Watseka, wōt'sē'ka, Ill., city, county-seat of Iroquois County, on the Iroquois River, and on the Chicago & E. I. and the Toledo, P. & W. R.R.'s, about 70 miles south of Chicago and 100 miles east of Peoria. It is in an agricultural and stock-raising region. The chief manufacturing establishments are flour and grist mills, planing mills, knitting mills, tile works, and machine shops. There are seven churches, public elementary schools, and two banks, capitalized at \$100,000, with deposits amounting to \$536,100. Pop. (1910) 2,476.

Watson, wōt'sōn, Alfred Augustus, American Protestant Episcopal bishop: b. New York 21 Aug. 1818; d. 21 April 1905. He was graduated from the University of New York in 1837, studied law and in 1841 was licensed to practise in the New York Supreme Court. He then turned his attention to theology, and in 1845 took priest's orders in the Episcopal Church. During the Civil War he served as chaplain in the Confederate army, and in 1884 was consecrated bishop of East Carolina.

Watson, David T., American lawyer: b. Washington County, Pa., 2 Jan. 1844. He was graduated from Washington and Jefferson College in 1864, studied law at Harvard for two years, was admitted to the bar and has since

successfully engaged in law practice in Pennsylvania. In 1903 he was chosen one of the three counsel for the United States before the Alaskan Boundary Commission.

Watson, Elkanah, American agriculturist: b. Plymouth, Mass., 22 Jan. 1758; d. Port Kent, N. Y., 5 Dec. 1842. He was apprenticed at 15 to John Brown of Providence, founder of the famous mercantile firm, and when 19 was intrusted by him with \$50,000 to be invested in cargoes for the markets of Europe. He made the journey to Charleston successfully and his journal, subsequently published, is the best existing account of the principal towns of the colonies at the time of the Revolution. He opened a branch house in Nantes, France, in 1779, meeting with much success for three years, when he lost his property through the crash of French finances. He returned to America in 1784, engaged in trade between South Carolina and Haiti until 1788, and in 1789 removed to Albany, where he was an active promoter of public enterprises. He projected an internal canal for New York State, founded the Albany Bank, organized the first agricultural society in New York, aided the establishment of western stage routes, and was an earnest worker for improved educational advantages. He removed to Port Kent on Lake Champlain in 1828. He published: 'Tour in Holland' (1790); 'History of Western Canals in the State of New York' (1820); 'History of Agricultural Societies' (1820). Consult Winslow C. Watson, 'Men and Times of the Revolution, or Memoirs of Elkanah Watson' (1855).

Watson, George Lennox, English naval architect: b. Glasgow 30 Oct. 1851; d. 12 Nov. 1904. After a five-years' connection (1867-71) with ship-building firms he established himself in Glasgow in 1872 as a naval architect. His first success was made in 1873 with the racing yacht Clotilde. Subsequently he designed more than 400 vessels, including, besides racing yachts, passenger, mail, and cargo steamers, and some of the largest steam yachts afloat. Among his racing yachts were Vanduara (for John Clark of Paisley); the cutter Britannia (for the Prince of Wales, now Edward VII.), and the Thistle, Valkyrie II., and Valkyrie III., competitors for the America's cup.

Watson, Henry Brereton, Marriott, English novelist: b. Caulfield, Melbourne, Australia, 20 Dec. 1863. Graduated from Canterbury College (Christchurch) in 1883, he went in 1885 to England, where he took up journalism in 1887. He wrote much for the 'National Observer' and was assistant editor of 'Black and White' and the 'Pall-Mall Gazette'. Among his works are: 'Marahuna' (1888); 'The Web of the Spider' (1891); 'The Adventurers' (1898); 'The Skirts of Happy Chance' (1901); 'The House Divided' (1901); 'Godfrey Merivale' (1902); 'Alarums and Excursions' (1903); and 'The Block House by Bull's Ferry' (1904). With J. M. Barrie he was joint-author of the drama 'Richard Savage.'

Watson, James Craig, American astronomer: b. Fingal, Ontario, 28 Jan. 1838; d. Madison, Wis., 23 Nov. 1880. He was graduated from the University of Michigan in 1857, was appointed professor of astronomy there in 1859, and in 1879 accepted the chair of astronomy at

the University of Wisconsin. He accompanied the eclipse expeditions to Iowa in 1869 and to Sicily in 1870, and was in charge of the expedition to Peking, China, for the observation of the transit of Venus in 1874. He was the discoverer of 23 asteroids, and of several comets, receiving the Lalande medal from the Paris Academy in 1870 for the discovery of six asteroids in one year. In 1867 he was elected to the National Academy of Sciences, an institution to which he bequeathed \$16,000 for a research fund and the "Watson medal." He published 'Popular Treatise on Comets' (1860); 'Theoretical Astronomy' (1868); 'Tables for Calculation of Simple and Compound Interest and Discount' (1879); etc.

Watson, John, Canadian philosopher: b. Glasgow, Scotland, 25 Feb. 1847. He was graduated from Glasgow University in 1872 and in the same year was called to the chair of mental and moral philosophy at Queen's University, Kingston, Ont. He has published 'Kant and His English Critics' (1881); 'Schelling's Transcendental Idealism: a Critical Exposition' (1882); 'The Philosophy of Kant as Contained in Extracts from His Own Writings' (1888); 'Comte, Mill, and Spencer, an Outline of Philosophy' (1895); 'Hedonistic Theories, from Aristippus to Spencer' (1895); 'Christianity and Idealism' (1896); 'An Outline of Philosophy with Notes Historical and Critical' (1898).

Watson, John ("IAN MACLAREN"), English Presbyterian clergyman and author: b. Manningtree, Essex, 3 Nov. 1850; d. Mount Pleasant, Iowa, 6 May 1907. He was educated at Edinburgh University, New College (Edinburgh), and the University of Tübingen, was licensed to preach by the free Church of Scotland in 1874, and appointed assistant minister of the Barclay Church, Edinburgh. In 1875 he was ordained minister of Logiealmond (Perthshire) Free Church, whence he went in 1877 to Free Saint Matthew's, Glasgow, and in 1880 to the Sefton Park Presbyterian Church of Liverpool. He was Lyman Beecher lecturer at Yale in 1896, and in 1900 moderator of the synod of the Presbyterian Church of England. Among his religious works are 'The Upper Room' (1895); 'The Mind of the Master' (1896); 'The Potter's Wheel' (1897); 'Companions of the Sorrowful Way' (1898); 'Doctrines of Grace' (1900); and 'The Life of the Master' (1901). He also published several works of fiction, beginning with 'Beside the Bonnie Brier Bush' (1894), a very successful collection of sketches of life and character in Highland and semi-Highland parishes, and including further 'The Days of Auld Lang Syne' (1895), 'Kate Carnegie' (1896), 'A Doctor of the Old School' (1897), 'Afterwards' (1898), and 'Rabbi Saunderson' (1898).

Watson, John Crittenden, American naval officer: b. Frankfort, Ky., 24 Aug. 1842. He was graduated from the United States Naval Academy in 1860, was promoted master in 1861, and assigned to the Sabine. He was transferred to the Hartford, flagship of Admiral Farragut, in 1862, and served under him throughout the war. He participated in the battles of Fort Jackson and Saint Philip, served in the passage of the Vicksburg batteries in 1862, of Fort Hudson in 1863, and was engaged at Mobile Bay in 1864. He received rank as lieutenant-commander in

1866, as commander in 1874, and in 1877-80 was in command of the Wyoming. He was light-house inspector in 1880-6, promoted captain in 1887, and commodore in 1897. In the Spanish-American War of 1898 he commanded the blockading squadron on the northern coast of Cuba, was transferred to the command of the Oregon later in that year, and in 1899 succeeded Admiral Dewey in charge of the Asiatic squadron at Manila, with rank as rear-admiral. In 1900-2 he was president of the Naval Examining Board, and since then has been president of the Examining and Retiring Board.

Watson, John Fanning, American antiquary: b. Batsto, N. J., 1780; d. Germantown, Pa., 23 Dec. 1860. He was a bookseller in Philadelphia for many years and made a careful study of early and Revolutionary history. His publications include: 'Annals of Philadelphia' (1830); 'Historic Tales of the Olden Times in New York' (1832); 'Annals of New York City and State' (1846); 'History of the United States' (1856).

Watson, Mungrave Lewthwaite, English sculptor: b. Hawkdale, Cumberland, near Carlisle, 1804; d. London 28 Oct. 1847. Meeting Flaxman in London in 1823 he gained the friendship of that sculptor, through whose influence he was admitted to the schools of the Royal Academy. He subsequently visited Rome, working under Chantrey (q.v.) and Behnes. His productions include a terra cotta relief, 'Suffer Little Children to Come Unto Me'; and statues of Flaxman, Nelson, Chaucer, and Queen Elizabeth.

Watson, Paul Barron, American author: b. Morristown, N. J., 25 March 1861. He was graduated from Harvard in 1881, subsequently studied law and was admitted to the bar, and has practised in Boston. His published writings are a 'Bibliography of the Pre-Columbian Discoveries of America,' privately printed in 1881, and included in the 4th (enlarged) edition of 'America Not Discovered by Columbus,' by R. B. Anderson (q.v.); 'Marcus Aurelius Antoninus' (1884), the first extended biography of the subject in English; and 'The Swedish Revolution under Gustavus Vasa' (1889).

Watson, Richard, English Anglican prelate: b. Heverham, Westmoreland, August 1737; d. Calgarth Park, Westmoreland, 4 June 1816. He was graduated from Trinity College, Cambridge, in 1759, became professor of chemistry there in 1764, and in 1771 was appointed regius professor of divinity. He became archdeacon of Ely in 1780, and in 1782 was consecrated bishop of Llandaff. His writings include: 'An Apology for Christianity' (1776); 'Chemical Essays' (5 vols., 1781-8); 'An Apology for the Bible' (1796); etc. Consult his son Richard: 'Anecdotes of the Life of Richard Watson' (1817).

Watson, Richard, English Methodist clergyman: b. Barton-upon-Humber, Lincolnshire, 22 Feb. 1781; d. London 8 Jan. 1833. He joined the Wesleyan Methodists at 15 and began preaching. He was ordained in 1800, and shortly afterward joined the Methodists of the New Connection, returning to the Wesleyans in 1812. He was appointed secretary of the Wesleyan Missionary Society in 1817, and in 1826 was president of the conference. He was for a time editor of the *Liverpool Courier* and wrote.

WATSON

'Apology for the People Called Methodists' (1800); 'Life of the Rev. John Wesley' (1831); 'A Biblical and Theological Dictionary' (1831); 'An Exposition of the Gospels of Matthew and Mark' (1833); etc. His collected works were edited by Thomas Jackson, in 13 vols., 1834-7, with 'Memoir'.

Watson, Robert Spence, English publicist and lawyer: b. Gateshead 8 June 1837. He was educated at University College, London, and established a law practice in Gateshead and Newcastle. He was president of the National Liberal Federation in 1890-1902, and has taken an active part in educational movements in Newcastle. He is also known for his writings on economic subjects, particularly the labor question. His publications include 'Industrial Schools' (1867); 'Higher Education in Boroughs' (1868); 'The History of English Rule and Policy in South Africa' (1879); 'Irish Land Law Reform' (1881); 'The Relations of Labor to Higher Education' (1884); 'Boards of Conciliation and Arbitration and Sliding Scales' (1886); 'The Peaceable Settlement of Labor Disputes' (1889); 'Labor, Past, Present, and Future' (1889); 'The Recent History of Industrial Progress' (1891); and 'The Duties of Citizenship' (1895).

Watson, Sereno, American botanist: b. East Windsor Hill, Conn., 1 Dec. 1826; d. Cambridge, Mass., 9 March 1892. He was graduated from Yale in 1847, studied medicine at the University of New York, and in 1867-9 was botanist to the government exploration of the 40th parallel under Clarence King (q.v.). In 1871 he became assistant curator at the Gray Herbarium at Harvard, and from 1874 until his death was curator there. He was elected fellow of the National Academy of Sciences in 1889. Among his publications are: 'Botany,' Vol. V. of 'Reports on the Geological Exploration of the 40th Parallel' (1871); 'Bibliographical Index to North American Botany, Part I., Polypetales' (1876); with W. H. Brewster and Asa Gray, 'Botany of California' (2 vols., 1876-80); etc.

Watson, Thomas, English poet: b. London about 1557; d. 1592. While his fame may seem to have been eclipsed by that of Spenser and Sidney, among his contemporaries he was equally popular for his pastoral and love poetry. He lived in a learned age and translated the 'Antigone' of Sophocles into very elegant Latin. His 'Melibœus, Thomæ Watsoni; seu, Ecloga in Obitum Domini Francisci Walsinghami, Equitis Aurati' (1590) was a graceful Vergilian tribute to the memory of the statesman and diplomat Francis Walsingham (q.v.). His sonnets, 'Tears of Fancie; or Love Disdained,' evidently gave suggestions to Shakespeare in the composition of his 'Sonnets.' Consult Arber, 'English Reprints' (1892).

Watson, Thomas Edward, American lawyer and politician: b. Columbia County, Ga., 5 Sept. 1856. He entered Mercer University but did not complete the course there, and then took up the study of law and was admitted to the bar in 1875. He began the practice of his profession at Thompson, Ga., and rapidly attained a reputation as one of the leading lawyers of the State. In politics he was at first a Democrat; was elected to the State legislature in 1882, and served as Democratic elector-at-large in 1888.

He was active in the Farmers' Alliance movement, and finally affiliated himself with the People's Party; in 1890 he was elected to Congress on the Populist ticket, and for some time edited a Populist paper at Atlanta. While in Congress he obtained the first appropriation for the rural free delivery of mail. He was the nominee of the People's Party for vice-president, in 1896, and for president in 1904, and in 1908 of the Populist Party for president. His publications include 'The Story of France' (1898); 'Life of Napoleon' (1902); 'Life and Times of Thomas Jefferson' (1903); etc.

Watson, William, American scientist: b. Nantucket, Mass., 19 Jan. 1834. He was graduated from the Lawrence Scientific School of Harvard in 1857; was an instructor there in 1857-9; in 1859-63 was in Europe collecting information on technical education, which, when communicated to W. B. Rogers, was made the basis of the organization of the Massachusetts Institute of Technology; and from 1865 to 1873 was professor of mechanical engineering and descriptive geometry in that institution. In 1884 he was elected secretary of the American Academy of Arts and Sciences. In addition to numerous technical papers, he has published various writings, including: 'Technical Education' (1872); 'Course in Descriptive Geometry' (1873); 'Courses in Shades and Shadows' (1889); 'The Civil Engineering, Architecture, and Public Works of the Paris Exposition of 1889' (1891); and 'The International Water Transportation Congress, Chicago, 1893' (1894).

Watson, William, English poet: b. Burley-in-Wharfedale, Yorkshire, 2 Aug. 1859. He was privately educated, and in 1880 published his first volume of verse, 'The Prince's Quest, and Other Poems,' which showed the influence of Keats and William Morris, and found favor with Rossetti. In 1884 he issued his 'Epigrams of Art, Life, and Nature,' containing much highly-finished work, but it was not till the publication of 'Wordsworth's Grave, and Other Poems,' in 1890, that he gained adequate recognition. The volume of his 'Poems' published in 1892 was a reprint of the 1890 volume with the addition of 26 new pieces. Of 'Lachrymæ Musarum, and Other Poems' (1892), the title-poem is a fine eulogy of Lord Tennyson. 'The Eloping Angels' followed in 1893, 'Odes, and other Poems,' in 1894, and 'The Father of the Forest, and Other Poems,' in 1895. To 1896 belong two volumes of sonnets on the Armenian atrocities, with the titles 'The Year of Shame' and 'The Purple East'; to 1897, 'The Hope of the World, and Other Poems.' His 'Collected Poems' (1898) ought rather to be called 'Selected Poems,' since from them are excluded all of the 1880 and 1893 volumes, more than half of the 'Epigrams,' most of 'The Year of Shame,' and portions of the other volumes. He wrote in 1902 one of the more prominent odes on the coronation of Edward VII., and in 1903 'For England.' He has written in prose a volume of literary essays, 'Excursions in Criticism' (1893). Watson's work is carefully wrought, reflective in tone, and marked by an air of distinction. It has been sometimes criticized as occasionally too closely an echo of greater poets. He was prominently mentioned as a possible successor to Tennyson in the laureateship.

Watsonville, wŏt'sŏn-vŭl, Cal., city in Santa Cruz County; on the Pajaro River, and on the Southern Pacific Railroad; about five miles from Monterey Bay, an arm of the Pacific Ocean, and 18 miles southeast of Santa Cruz. It is in an agricultural and fruit-growing region. Sugar beets are one of the chief products grown in the vicinity. The principal manufacturing establishment is the sugar beet factory, which has a beet-crushing capacity of over 1,000 tons and a sugar manufacturing capacity of over 200 tons each day. There are four state banks, capitalized for \$180,000, and with deposits amounting to \$1,468,000. Pop. (1910) census, 4,446.

Watt, wŏt, James, Scottish engineer: b. Greenock, Renfrewshire, 19 Jan. 1736; d. Heathfield, near Birmingham, Staffordshire, 25 Aug. 1819. Having determined to adopt the trade of mathematical instrument maker, he spent a year in London learning the art, in which he attained great dexterity, and after his return endeavored to set himself up in business in Glasgow. In this he might not, perhaps, have succeeded, owing to the opposition of other workers in the trade, had he not been appointed (1757) mathematical instrument maker to the university, which was outside of the jurisdiction of the Glasgow municipality. While thus employed he was also active in preparing surveys and reports in connection with canal, river, and harbor work. It was during this period that he thought of and completed most of his improvements of the steam-engine. The idea of a separate condenser first occurred to him in 1764, and in January 1769 he took out the patent for the improvements of the steam-engine in which this idea was applied. Previous to Watt's time, the cylinder itself had been used as a condenser, and the jet of cold water introduced into the cylinder to condense the steam so reduced the temperature of the cylinder that three times as large a supply of steam (so Watt estimated) was demanded as was really needed. Watt, therefore, set to work to condense the steam in a separate receptacle. The change was so important as to make him almost the inventor of the modern engine. But it was not till the year 1774 that he united with Matthew Boulton (q.v.), a manufacturer at Birmingham, in order to carry his improvements into execution. In consequence of this he removed to Soho, near Birmingham, where the establishment in which his steam-engines were manufactured soon acquired a European fame. He retired from the business in 1800, when his patent, which had been renewed in 1775 for 25 years, expired. Watt was a fellow of the Royal Societies both of London and Edinburgh, and one of the few natives of Great Britain who have been elected members of the National Institute of France. Besides the expedient of the condenser, Watt made also other improvements in the steam engine. He devised the sun-and-planet gear wheel, made use of the expansion principle to obtain the double engine, applied the governor to the regulation of the speed of steam-engines. He also patented a fuel-saving furnace, invented copying ink, and independently discovered the chemical composition of water. He had a powerful memory, and the range of his reading was very wide. Chemistry, architecture, music, law, metaphysics, and language were the principal subjects which

in addition to physical science and its practical applications, engaged his attention, and in all of them his knowledge was wonderfully extensive, minute, and accurate. For an account of the improvements that Watt effected in the steam-engine see STEAM-ENGINE. The significance of his work places him among the foremost of inventors. Consult further, Muirhead, 'Origin and Progress of the Mechanical Inventions of James Watt' (1854); a 'Life' abridged from the preceding (1868); Smiles, 'Lives of Boulton and Watt' (1865); Thurston, 'The Growth of the Steam-Engine' (1879); and an article by Cowper in the 'Transactions' of the Institution of Mechanical Engineers for 1883.

Watt, in electricity, the unit of activity or rate of doing work. It is measured by the product of the voltage or electromotive force of the source into the current supplied. Thus a dynamo which is yielding 30 amperes at a voltage of 100 is working with an activity of 3,000 watts. The watt is equal to 0.735 foot-pound per second; so that one horse-power per second is equal to 746 watts. It is customary to use the kilowatt as the practical unit. See OHM; WATT; VOLT.

Watteau, vâ-tô, Jean Antoine, French painter: b. Valenciennes 10 Oct. 1684; d. Nogent-sur-Marne 18 July 1721. His parents, whose situation in life was humble, with difficulty contrived to give him the instructions of a very inferior master in the country. In 1702 he went to Paris, in company with a scene-painter, with whom he continued to work for a few months. Soon after he found employment with one Claude Gillot, who, although only a painter of decorations for ballets, and a designer of costumes and of patterns for tapestry, was a true artist. With him he found an opportunity of practising in all these branches of art, and when he left him he found another master in Claude Audran, a very able man, keeper of the Luxembourg, who was of great service to him in opening to him the famous gallery of the palace in which Rubens had painted in allegory the history of Marie de Médicis. From the study of the great Flemish master he improved his coloring, and when he left Audran 1709 he was a consummate master of his art and a painter of "Fêtes Galantes." He now began to paint on his own account, but met at first with little encouragement. He failed to secure the "Prix de Rome," which would have enabled him to visit Italy, but soon afterward scored a triumph by his 'Un Départ de Troupes.' He was admitted to the Académie in 1717 as a painter of "Fêtes Galantes," and produced many pictures whose power and grace in drawing and coloring his rivals strove in vain to emulate. His subjects were all genre, military, and civil. He excelled in reproducing the costumes, airs, and graces of the fashionable world of his time. His 'L'occupation selon l'Age' sold in 1891 for \$27,300. A year or two before his death he went to England, in order, it is said, to consult a certain Dr. Meade regarding his health, which was never robust. He remained a year, and seems to have received more injury to his health from the English climate than benefit from the doctor's prescriptions and returned to France only to die in the arms of his friend Gersaint.

Consult: Goncourt, 'Catalogue raisonné de l'œuvre peint, dessiné et gravé d'Antoine Wat-

teen' (1875); Pater, 'A Prince of Court Painters' (in 'Imaginary Portraits,' 1887).

Watterson, wôt'er-sôn, Henry, American journalist: b. Washington, D. C., 16 Feb. 1840. He was privately educated, and began journalistic work as editorial writer for the *Washington Star*. In 1861 he joined the Confederate army as a private, and later was aide-de-camp to Generals Forrest and Polk. In 1862 he withdrew from the army to edit the *Rebel* at Chattanooga, a daily paper, recognized as an organ of the Confederate government, but in 1864 returned to the army, and had part in Gen. Johnston's campaign, and the siege of Atlanta. After the war he revived the publication of the *Nashville Republican Banner*; and in 1867 became editor of the *Louisville Journal*. This paper he united with the *Courier*, under the name of the *Courier-Journal*, of which he became editor-in-chief and which he has made one of the leading Southern newspapers. He has been active in politics as a member of the Democratic party; was delegate-at-large to every Democratic National Convention from 1872-92, and was permanent chairman of that of 1876. He was a member of Congress in 1876-8. Though a staunch supporter of Tilden for the presidency, yet in Congress he was one of the leaders in obtaining a peaceable adjustment of the election dispute, and approved the appointment of the Electoral Commission (q.v.). In 1896 he refused to support the Chicago platform of the Democratic Party, and was affiliated with the Gold Democrats. As speaker and editor he has been a consistent advocate of free trade, and particularly of a policy of conciliation between the North and the South. He has published 'Oddities of Southern Life and Character' (1882); 'History of the Spanish-American War' (1899); and 'Abraham Lincoln' (1899).

Wat'-de-bird, or **Wattle-crow**, an Australian honey eater (*Anthochaera carunculata*), so named from the large reddish wattles on its neck. It is about the size of a magpie, and is of bold, active habits.

Wattles, arborescent shrubs (*Acacia*) of Australia and Tasmania, in some places growing to good-sized trees. They have foliage which is compound or reduced to phyllodia, and pretty, crowded flowers, in globose or cylindrical heads. The wattles furnish a gum, used as an adhesive in cotton-printing; the stems make poles, which are serviceable for many "bush" purposes. The bark is a valuable tanning material, known as mimosa- or wattle-bark, and many of the acacia forests have been killed by the stripping of their cortex for this purpose. A good quality of tan-bark is obtained from *A. decurrens* and *A. mollissima*, the black, green, or feathered wattle found also in South Africa. It is one of the most graceful of the acacias, and least destructive of this thorny race to person and clothing. The silver wattle (*A. dealbata*) is a taller tree than the black wattle, with ashen-tinted young foliage. The African wattle is *A. natalia*; the Alpine, *A. pyramidalis*, from the Victorian Alps. *A. juniperina*, the prickly wattle, is an evergreen shrub of Australasia. The raspberry-jam wattle (*A. acuminata*) of the same region, yields a cabinet wood, having the odor of that sweetmeat. The wallaby- (*A. rigens*) and varnish-wattle (*A.*

verniciiflua), are also Australian shrubs. The soap-pod wattle is the same as the soap-nut (q.v.) of India. Savannah wattles are West Indian trees (*Cithorexylum quadrangulare* and *C. cinerea*) of the verbena family.

Watts, wôts, George Frederick, English painter: b. London 23 Feb. 1817; d. there 1 July 1904. He studied in the Royal Academy and in 1837 exhibited there two portraits of young ladies and a subject-picture entitled 'The Wounded Heron,' and afterwards contributed to various art exhibitions, notably the Royal Academy, the Grosvenor Gallery, and the New Gallery, about 300 pictures of various kinds. Some of these are landscapes and seascapes; a few, such as 'The Sempstress' and 'Under the Arch,' portray contemporary life; but the finest and most characteristic are portraits and allegorical or ideal subjects. His portraits include those of the most eminent men and women of his age, and perhaps form his chief claim to renown, as they were the basis of his reputation as an artist. Of his other pictures the following may be mentioned: 'Isabella Finding Lorenzo Dead' (1840); 'Paolo and Francesca' (1848); 'Orlando Pursuing the Fata Morgana' (1848); 'Life's Illusions' (1849); 'Sir Galahad' (1862); 'The Wife of Pygmalion' (1868); 'The Return of the Dove to the Ark' (1869); 'Daphne' (1870); 'Fata Morgana' (1870); 'The Curse of Cain' (1872); 'The Prodigal' (1873); 'Dedicated to all the Churches' (1875); 'The Dove that Returned not Again' (1877); 'Love and Death' (1877); 'Time and Death' (1878), like the preceding, one of his most notable pictures; 'Orpheus and Eurydice' (1879); 'Paolo and Francesca' (1879); 'Psyche' (1880); 'The Rider on the Pale Horse,' 'The Rider on the Black Horse,' 'The Rider on the White Horse,' and 'The Rider on the Red Horse,' all apocalyptic pictures of 1883; 'Love and Life' (1884); 'Rain Passing Away' (1884); 'The Angel of Death' (1888); 'The Wife of Plutus' (1889); 'She Shall be Called Woman' (1892), a large picture of Eve; 'For He Had Great Possessions' (1894); 'The Outcast' (1895); 'Jonah' (1895); 'Eve Tempted' and 'Eve Repentant' (1896); 'Love Triumphant' (1898); 'Court of Death' (1902). He was in Italy during 1843-7, and was powerfully influenced by Titian and Tintoretto. In 1847 his colossal oil-pictures of 'Echo' and 'Alfred inciting the Saxons to prevent the Landing of the Danes' were awarded a prize of £500 in another Westminster Hall competition. The latter of these now adorns a committee room of the Houses of Parliament. He completed a fresco, 'St. George Overcomes the Dragon,' in 1853, for the Houses of Parliament, and at a later date painted in fresco the west end of the new hall at Lincoln's Inn. After 1896 he was on the list of retired academicians. A large number of his portraits, presented by him to the nation, are now in the National Portrait Gallery, and some of his best allegorical paintings were presented to the National Gallery of British Art (Tate Gallery). To use his own words, he painted ideas rather than objects, and the poetic idealism to which he was faithful throughout all his long career stood in the way of extensive popularity. His drawing was of the utmost correctness and his coloring often extremely

WATTS — WAUKEGAN

time, but while his allegorical subjects were often great in conception and treatment they sometimes required too much literary exposition to appeal to the ordinary picture lover in a clear and direct manner. Consult Monkhouse, 'British Contemporary Artists' (1889); Bateman, 'G. F. Watts' (1901); Chesterton, 'G. F. Watts' (1904).

Watts, Isaac, English Congregational divine: b. Southampton 17 July 1674; d. Stoke, Newington, London, 25 Nov. 1748. He was educated for the ministry at an academy in Stoke-Newington. In 1696-1702 he was a private tutor, in 1699-1702 was assistant to Isaac Chauncy, minister of the Congregational chapel in Mark Lane, London, and in 1702 succeeded to the pastorate. The congregation here was a distinguished one. Watts remained nominally pastor until his death, though from 1713 ill-health frequently interrupted his ministry, and Samuel Price was made co-pastor. Watts had in his own time great popularity as a writer, his manuals of religious instruction and his works of popular divinity having large circulation; while his 'Horse Lyricæ' (1706) admitted him to Johnson's 'Lives of the Poets' and was reprinted in 1834 in a series of 'Sacred Classics' with a memoir by Southey, and his hymns, numbering in all about 600, were the chief part of the psalmody of English Nonconformist congregations. At the beginning of the 18th century only a few unimportant hymns had been written for Dissenters' use, the rule of Calvin having permitted only canticles and metrical Psalms. The dearth of suitable tunes and the custom of 'lining out' hampered Watts' work; he had, too, many defects in rhyme and diction, was at times rhetorical and at others prosaic. But his best hymns are among the finest in English. Many are found in all hymn-books, and about a dozen remain in very general use. A collection was made in 1707, a second edition appearing in 1709. He published in 1722-4 doctrinal treatises of an Arian tendency, but grounds are wanting for believing that he finally passed to that position. His 'Works' were edited by Jennings and Doddridge in 1753; the 'Posthumous Works' were published in 1779. The former were reprinted with additions, and a memoir by Burder, in 1810. Consult further: Gibbons, 'Memoirs' (1780); Milner, 'Life' (1834); Hood, 'Life' (1875); Julian, 'Dictionary of Hymnology' (1892).

Watts, Thomas Hill, American politician: b. Butler County, Ala., 3 Jan. 1819; d. Montgomery, Ala., 16 Sept. 1892. He was graduated from the University of Virginia in 1840, established a law practice in Greenville, Ala., was elected to the State legislature in 1842, 1844-5, and to the State senate in 1853. He opposed the secession movement, but upon the secession of Alabama accepted the situation. He was appointed colonel in the Confederate army and fought at Shiloh, but resigned shortly afterward to become attorney-general in the Confederate cabinet. He was elected governor of Alabama in 1863, but was unseated by the Federal government at the close of the war. He was thereafter engaged in law practice at Montgomery, and with the exception of 1880-1, when he served in the legislature, held no further public office.

Watt's Dyke. See **OFFA'S DYKE**.

Watts-Dun'ton, Theodore, English poet, critic, and novelist. b. St. Ives, Huntingdonshire, 1836. He was educated privately at Cambridge and for a time studied law, but had already gained a reputation as a writer of sonnets when he joined the staff of the 'Examiner' as literary and art critic. On leaving the 'Examiner' he joined the 'Athenæum' staff, and for many years has been one of the chief contributors to that review, his criticisms of poetry being of the most illuminating character. In 1897 he published a poem entitled 'Jubilee Greeting at Spithead to the Men of Greater Britain,' which met with wide appreciation; and in the same year collected in 'The Coming of Love, and Other Poems,' some of the more important of his poetical contributions to the 'Athenæum' and other literary journals. 'Aylwin,' a novel or romance published in 1898 (privately printed 1883), forms a striking prose counterpart to 'The Coming of Love,' and contains excellent pictures of gypsy life. Watts-Dunton has also contributed largely to the 'Nineteenth Century' and other periodicals. Several of the notices in Ward's 'English Poets' are from his pen, and the valuable critical article on poetry in the 'Encyclopædia Britannica' was written by him. Later publications are: 'The Christmas Dream' (1901), and 'The Renaissance of Wonder' (1902). On occasion Watts-Dunton makes free use of the Romany dialect, which he has carefully studied. His best work is probably the critical, especially that dealing with the principles of verse. Consult: Miles, 'Poets and Poetry of the Century,' Vol. IV. (1901); also an article in the 'Idler,' Vol. V., and one by Nicoll in the 'Contemporary,' Vol. LXXIV.

Wagh, wā, Arthur, English author: b. Midsomer Norton, Somerset, 24 Aug. 1866. He was graduated from Oxford in 1889, became a journalist in London in 1890, was London correspondent of the New York 'Critic' in 1893-7, and in 1894 was sub-editor of the London 'New Review.' He acted as literary adviser to Kegan Paul and Company in 1895-1902, and is now managing director of the London publishing firm of Chapman & Hall. He has written: 'Gordon in Africa' (1888); 'Alfred, Lord Tennyson, a Study' (1892); 'Legends of the Wheel' (1898); etc.; and has edited: Johnson's 'Lives of the Poets' (6 vols., 1896); Biographical edition of Dickens (19 vols., 1902-3); and other works.

Waukegan, wā-kē'gan, Ill., city, county-seat of Lake County; on Lake Michigan, and on the Chicago & N. W.; the Elgin, J. & E. (Belt Line) R.R.'s; 35 miles north of Chicago, and 50 miles south of Milwaukee. There are two electric lines which connect the city with the lake ports and near-by villages and towns. The city is on a bluff about 80 feet above the lake. There is a fine beach and a good harbor, which has been improved, thus giving Waukegan the advantages of the lake traffic. It is in an agricultural region, but the city is best known for its manufacturing industries. The chief industrial establishments are steel and wire works, which have about 2,000 employees; sugar refineries, 1,600 employees; brass and iron works, 200; tannery, 100; wood-working factory, 150; wrapper factory, 75; roofing material works, 50; electric scale works, 100;

WAUKESHA—WAUSAU

brewery, 30; and organ-stop factory, 50. The battery company employs about 75 persons, and the coal and dock company about 100. The increase in the manufactories and the number of employees since 1900 shows the growth of the industrial interests of the city. In 1909 (government census) there were 59 manufacturing plants, capitalized for \$17,092,000, and employing 3,090 persons, to whom were paid annually \$2,689,000. The average annual cost of material used was \$14,164,000, and the value of the products, annually, was \$19,984,000. The city ships large amounts of lumber, coal, salt, iron, grain, and manufactured products. The principal public buildings are the county court-house, the municipal buildings, the Jane McAlister Hospital, the library, the churches, and the schools. There are 15 churches, a high school, public and parish elementary schools, and the Carnegie Public Library. The three banks, one national and two state, have a combined capital of \$200,000, and deposits amounting to very nearly \$3,000,000. The government is conducted on the Commission plan; this being one of the 17 cities of Illinois so governed by the month of August, 1911.

The place was settled in 1835 by Thomas Jenkins; was incorporated in 1840, and chartered as a city in 1859. Pop. (1900) 9,426; (1910) 16,069.

W. L. FARNER,
Editor 'Gazette.'

Waukesha, wā'kē-shā, Wis., city, county-seat of Waukesha County; on the Fox River, and on the Chicago M. & St. P., the Chicago & N. W., and the Wisconsin C. R. R.'s; about 18 miles from Lake Michigan, and 98 miles north of Chicago. It was settled in 1834 by Morris D. Cutter. It was incorporated in 1855 and in 1896 was chartered as a city. There are electric railways connecting the city with Milwaukee and with Pewaukee Lake. The city is in an agricultural region, and near by are quarries of dolomite stone much used in buildings. There are here magnesian springs which are noted for their medicinal properties. The waters are bottled for several markets. The chief manufactures are steel and iron products, bottles, beer, flour, and lumber products. There are railroad shops and machine shops. There are nine churches. The educational institutions are Carrol College (Presb.), State Industrial School, a high school, established in 1890, graded public school, Roman Catholic and Lutheran parish schools, and the Carnegie Public Library. The two banks have a combined capital of \$200,000, and the annual business is over \$2,000,000. The government is vested in a mayor and a council of 10 members. Pop. (1910) 8,740.

H. M. YOUNG,
Editor 'Freeman.'

Waukon, wā-kōn', Iowa. town, county-seat of Allamakee County; on the Chicago, Milwaukee & Saint Paul Railroad; about 80 miles north by west, in direct line, from Dubuque. It is in an agricultural, fruit growing, and stock-raising region. It has flour mills, creameries, wagon factories, canning factory, machine shop, grain elevator, and stock-yards. There are seven churches, a high school, public and parish elementary schools, a business college, and a public library. There are three banks, having a combined capital of \$115,000 and deposits amounting to \$627,530. Pop. (1910) 2,779.

Waul, wāl, Thomas Neville. American lawyer: b. Sumter District, S. C., 3 Jan. 1813. He was educated at Columbia College, was licensed to practice law in 1834, and engaged in that profession in Mississippi until 1850, when he removed to Gonzales County, Texas. He served in the Provisional Congress of the Confederate States in 1861-2, recruited in the first year of the war 2,000 troops known as "Waul's Legion," received commission as their colonel, and served through the war. He was a member of the Texas Reconstruction Convention in 1865, and afterward engaged in law practice at Galveston, Texas, until 1896, when he retired.

Waupaca, wa-pā'ka, Wis., city, county-seat of Waupaca County; on the Waupaca River, and on the Wisconsin Central Railroad; about 133 miles northwest of Milwaukee and 38 miles northwest of Oshkosh. It is in an agricultural and stock-raising region. It has excellent water-power, and many attractions which make it a favorite summer resort. The climate is cool in summer and in the vicinity are a number of small picturesque lakes. The chief manufacturing establishments are flour mills, lumber and woolen mills, machine shops, and potato starch factories. It has the State Soldiers' Home, public graded schools and four churches. The two banks have a combined capital of \$100,000. Pop. (1910) 2,789.

Waupun, wāpūn', Wis., city in Fond du Lac and Dodge counties; on the Chicago, Milwaukee and Saint Paul Railroad; about 70 miles northwest of Milwaukee and 17 miles southwest of Fond du Lac. It is in an agricultural region. The chief manufacturing establishments are pump and wind-mill factories, cane goods works, umbrella factory, flour and lumber mills, and creameries. In 1900 (government census) there were 42 manufactories, capitalized for \$493,590. The cost of the raw material used annually was \$793,504, and the value of products was \$1,200,844. The principal buildings are the State prison, the city hall, the churches and schools. The national bank has a capital of \$50,000 and deposits of approximately \$305,300. There are nine churches, a high school, graded schools, and a school library. Pop. (1910) 3,500.

Wausau, wā'sā, Wis., city, county-seat of Marathon County; on the Wisconsin River, and on the Chicago, M. & St. P., and the Chicago & N. W. R.R.'s; about 175 miles northwest of Milwaukee and 130 miles north of Madison, the State capital. The city lies on both sides of the river, and the slope is gradual, but sufficient to give good surface drainage. There are parks, broad paved streets, well shaded, and an excellent water system. The reservoir has a capacity of 3,000,000 gallons per day, and the water is obtained from Big Bull Falls. Wausau is in a region of extensive lumbering interests. The chief manufacturing establishments are saw mills, which employ about 1,000 men; sash and door factory, about 400; box factories, granite works, sand-paper factory, machine shops, excelsior factories, novelty works, veneering factories, canneries, paper mills, and flour mills. In 1909 (government census) Wausau had 67 manufacturing establishments, capitalized for \$5,794,000, and employing 2,285 persons, to whom were paid annually \$1,214,000. The raw material used each year in the manufactories

WAUSEON — WAVE

cost \$3,325,000, and the value of the finished products was \$6,287,000.

The county court-house (cost \$60,000), the government building, the municipal buildings, the County Asylum for the Insane, the churches and schools, the library, and several fine business blocks are among the principal public buildings of the city. There are 20 churches, representing 15 different denominations. The educational institutions are a fine public high school, graded elementary public schools, 10; Roman Catholic and Lutheran parish schools, 5; and a public library. It has also the County Training School for Teachers and a County Agricultural College. There are two national banks and one state bank, having a combined capital of \$410,000, and deposits amounting to about \$3,000,000. The government is administered under a revised charter of 1892, which provides for a mayor and a council of 18 members, who are elected biennially.

Wausau was settled in 1845 by lumbermen. It was planted in 1852 and existed under a town organization until 1861, when it was incorporated as a village. On 18 March 1872 it was chartered as a city. Pop. (1890) 9,253; (1900) 12,354; (1910) 16,560.

E. B. THAYER,
Editor 'Wausau Pilot.'

Wauseon, wá'se-ŭn, Ohio, village, county-seat of Fulton County; on the Lake Shore & Michigan Southern Railroad; about 31 miles west by south of Toledo. It is in an agricultural region, in which are cultivated grain and vegetables. It has flour mills, creamery, machine shop, and wagon works. It has two private banks. The educational institutions are a public high school, graded school, and a public library. Pop. (1910) 2,200.

Wauters, vō-tār, Emile, Belgian painter: b. Brussels 29 Nov. 1846. He was for four years the pupil of Portaels and of Gerome at Paris. His picture, 'Fair Edith finding the Body of Harold on the Field of Hastings,' attracted wide attention and he was sent by his government to attend in a professional capacity the opening of the Suez Canal. He returned from the East with many sketches and genre pictures and materials, out of which he afterward painted his panorama, 'Cairo and the Banks of the Nile.' His historical pictures are characterized by strong drawing and beauty of coloring; the most famous of these is 'Mary of Burgundy before the Magistrates at Ghent.'

Wave, a form of energy propagated from one part of a medium to another by the disturbance in equilibrium, or stress. Examples, water waves, such tides, rollers, ripples; sound waves; heat and light waves; electrical waves; earthquake waves; temperature waves, etc.

Waves in Liquids.—Waves of translation in liquids are formed where the particles of the liquid are moved slightly in advance of their position by the passage of the wave impulse. This wave was thoroughly investigated by Scott Russell, and is known as the Scott Russell wave.

'Its velocity is equal to $\sqrt{g(h+k)}$ where (g) is the force of gravity, (h) the depth of the liquid, at rest, and (k) the height of the crest above the plane of rest.' This is the speed at which a canal boat is most economically propelled; for the reason that the boat rides on the

wave, is carried forward by it, and its speed maintained with the least additional expenditure of power. Oscillatory waves, such as the deep "swell" of the ocean, are formed when the particles of the liquid are forced into circular, or elliptical paths, whose plane is vertical to the line of propagation. When the line of propagation of the disturbance is opposite, and equal to the flow of the liquid, "Standing Waves" are the result, as is often seen in rivers. The velocity of oscillatory waves has been estimated as "40 feet per second for waves of 300 feet in length; and the disturbance of the water particle at a depth of 300 feet to be not over half an inch from its mean position." Ripples in liquids are surface waves which move more rapidly as they diminish in length. "A ripple a quarter of an inch long will move one foot in a second. A ripple an eighth of an inch long will move one and a half feet in a second." This is due to the surface tension of the liquid.

Waves in Aeriform Bodies.—Waves are propagated in air by alternate condensations and rarefactions of the medium. The motion of the air particle is very small, but the wave-length is comparatively long. This length may be found by dividing the velocity by the number of vibrations in a given time. In the propagation of the wave, the layers of air are crowded together and a condensation is thus produced at first, after which a corresponding rarefaction takes place. A wave therefore consists of two parts. The motion of the air particle is backward and forward, and not vertical to the line of propagation, as in the case of water waves. A series of waves in air will show alternate condensations and rarefactions in the form of ever increasing spherical shells (Fig. 1).

FIG. 1.

The velocity of sound waves in aeriform gases varies directly as the square root of the elasticity of the gas, and inversely as the square root of its density. It is usually expressed by the formula

$\sqrt{\frac{E}{D}}$ There is an added velocity of 2 feet for

every Centigrade degree of temperature. So long as aeriform waves are not obstructed in their motion they are propagated in the form of concentric spheres; but when they meet with an obstacle they return upon themselves, forming new concentric waves according to the laws of reflection, see Fig. 2.

Waves in aeriform bodies are also refracted, or bent out of their course, in passing from one medium to another. Two sets of waves which interfere will produce a wave which is equal to their algebraic sum. If the waves are equal and in opposite phases, the sum of their component forces will be zero, and the air particle will come

WAVE

to rest. When a wave of water meets an obstacle, such as a rock, it bends around it, meeting on the other side. This is also the case with waves in air and gases, but the wave so diffuses itself at the back of the obstacle that it is enfeebled in power, and the obstacle casts what is known as a shadow. Sound shadows and light shadows are due to this property of wave motion.

Waves in Solid Bodies.—The vibration of wood and metals in the form of rods and plates may be taken as examples of wave motion in solids. (See **VIBRATION**.) When the vibrating particles of the solid yield up their motion to other particles which in turn perform like excursions in the same period of time, we have a wave propagated through the solid. Such waves in all mediums capable of resistance to distortion, are both transverse and longitudinal. This is the case when an iron bar is struck a blow by a hammer upon one end, two waves are sent through the bar, but the longitudinal has much greater velocity in this case.

FIG. 2.

Earthquake waves are propagated in like manner through the solid earth. The waves which pass through the elastic materials of the earth's crust consist of both longitudinal and transverse vibrations, but the transverse vibrations soon die out, and produce but little effect. In an earthquake disturbance the particles nearest the disturbance are first compressed by the concussion, and then released by the elasticity of the solid earth. This vibratory motion is taken up by the next contiguous particles, and in this manner the pulse or wave is carried to enormous distances. The vibrations of the particles themselves are very small, probably not over one or two inches in length in most cases. If the earth were a homogeneous solid the wave would take the form of concentric spherical shells, similar to air waves, but owing to the different materials composing its crust, and the fractured nature of the crust, its symmetry is destroyed. It should be remarked that the wave here under discussion is the vibratory movement of the crust, and not the violent upheaval, or disruption of the earth itself. When the centre of disturbance is beneath the sea a water wave is generated which travels much slower than the wave through the solid part of the earth. Air waves are also generated by earthquakes which follow the laws of sound waves.

Luminous and Electrical Waves.—The Undulatory Theory of Light presupposes the existence of an invisible medium, filling all space, both molecular and stellar, called the ether,

through which waves of light are propagated, according to the laws of vibration in an elastic solid; and with a velocity equal to the square root of its elasticity divided by the square root

of its density; or $\sqrt{\frac{E}{D}}$.

"In such a medium where the density (D) is small, in comparison with the rigidity that it opposes to any rapid movement, waves will be set up in all directions at right angles to the line of displacement. Let (M) represent a molecule of ether displaced in the direction of the arrow, from A to B ; then (a) will represent one of the waves thus generated at right angles to A, B ."

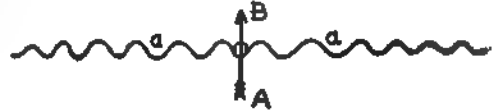


FIG. 3.

There are innumerable such waves in every ray of light, which are said to be transverse to the line of propagation. Their velocity is 186,000 miles per second, and their wave-lengths vary from 32 millionths, to 15 millionths of an inch. (See **LIGHT**; **SPECTRUM**; **RADIATION**.) This elastic, solid theory of light has been mathematically treated by Green, Fresnel, MacCullagh, Neuman, Cauchy, and others; and has been generally accepted, up to the last few years, as explaining the various phenomena of light. In recent years, especially since 1887, the Electro Magnetic Theory has largely taken its place.

Recent discoveries have shown that electric waves are identical with light waves in the following respects: they can be reflected, refracted, absorbed, polarized, and diffracted. They differ from light waves in their lengths, which are many feet, instead of a few millionths of an inch. In 1864, before these discoveries were made, Professor Clerk Maxwell predicted that light would be found to be due to electrical vibrations in space. This prediction has been abundantly verified by the investigations of Hertz, and others. The investigations of Hertz are illustrated by the following diagram:

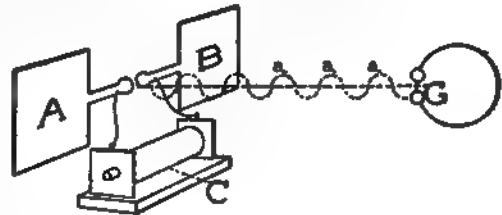


FIG. 4.

The electrical discharges of an induction coil (C) are sent through two square sheets of metal (A and B) attached to two metal rods, with a gap between them. These discharges produce electrical oscillations, backward and forward, through the plates and rods, and when the electrical state is sufficiently high, they become visible as a spark, or are luminous. From the discharge, or electrical oscillations in the plates and rods, electric waves (a, a, a) were set up

WAVE OFFERING—WAVERLY

at right angles to the plane of the plates, which traveled with the same velocity as light waves, and became visible to the eye by means of a spark passing across the gap (G) in a metal ring which was placed in the plane of their vibration. Hertz and others reflected these waves by parabolic mirrors, and refracted them with prisms of pitch, also polarized and diffracted them. Professor Righi verified these results, and demonstrated their interference fringes by Fresnel's mirrors. He also investigated the transparency of different media to these waves, and found that certain kinds of wood polarizes them, as tourmaline polarizes light. "Proofs are now complete that these waves possess all the known properties of ordinary light." The most recent application of these waves is to be found in wireless telegraphy.

JOHN R. PADDOCK,
Member of the Association for the Advancement
of Science.

Wave Offering, in Hebrew, *tenuphak*, from *nuph*, to wave, a sacrificial ceremony mentioned in the Old Testament, in Leviticus xiv. 24, in the rites to be followed in cleansing a leper, and in Numbers vi. 20, in the description of ceremonies attending the separation of a Nazarite, and in other places. The offering is believed by the rabbis to have been waved to the four points of the compass, as an acknowledgment of God's sovereignty over the earth, while the heave offering, mentioned in connection with the wave offering, is supposed to have been lifted upward as a tribute to God's rule in heaven.

Wave Motor, a mechanism for obtaining power from the force of ocean waves. The method as adopted in various experiments is as follows: At a point unprotected by outlying rocks or shoals, two wells eight and five feet in diameter, respectively, are sunk in the cliff, one behind the other, the foremost but five feet from the brink. These wells extend from 30 feet above high tide to below the ebb and open at bottom in the ocean. A counterbalanced float rises and falls between vertical guides in the foremost well as the swells outside raise or lower the water level. The plunger of a common force pump working in any part of a long pump barrel occupies the second well, forcing on the down stroke the salt water vertically 125 feet to a 5,000-gallon tank raised on a 60-foot derrick on the bank above. A 35-foot, four-post derrick carries the vertical guides for pump and float, which are fastened at and near the outer end of a 12-inch round timber 60 feet in length, the butt counterbalanced on the bank over two small iron car-wheels rolling on a short track, and thus allowing the timber to recede and advance as well as to oscillate as its outer end follows the vertical guides. The stopping and starting contrivance is the climax of simplicity. A strong chain leads from the outer end of the beam above the float over two shelves at the top of the derrick, and suspends a large barrel in vertical guides at the side. To stop the motor the barrel is filled with water from a short garden hose attached to a convenient connection from the tank. The weight of the filling barrel gradually overbalances the float, raising it above the waves. When the motor is to start, a plug is pulled from the bottom of the barrel and the float gradually goes into action.

Wavellite, an attractive, radiated mineral, essentially a hydrous basic phosphate of aluminum, $4\text{AlPO}_4 \cdot 2\text{Al}(\text{OH})_3 + 9\text{H}_2\text{O}$. It rarely occurs in distinct orthorhombic crystals; usually it is in more or less complete spherical aggregates, externally showing crystal terminations and with radiated structure. Its hardness is 3.25 to 4, and its specific gravity about 2.32. In the many European localities its color is usually white or pale green; at its most important American locality in Arkansas it is light to dark green, while the curious stalactitic wavellite of White Horse, Pennsylvania, is white.

Waverley, *wá'v-ér-ll*, or 'Tis Sixty Years Since, a novel by Sir Walter Scott. It was the earliest of the world-famous series of romances to which it gives its title, and was published in 1814. The author withheld his name at first, from doubt as to the success of the venture. The continuance of the concealment with subsequent issues followed perhaps naturally; Scott himself could give no better reason afterward than that "such was his humor." Although the authorship of the series was generally credited to him, it was never formally acknowledged until the avowal was made in 1827 at a dinner for the benefit of the Edinburgh theatrical fund. 'Waverley' is a tale of the rebellion of the Chevalier Prince Charles Edward, in Scotland in 1745.

Waverly, Ill., village in Morgan County; on the Jacksonville & St. L., and the Saint Louis, C. & St. P. R.R.'s; about 26 miles southwest of Springfield and 20 miles southeast of Jacksonville. It is in an agricultural and stock-raising region, and has flour mills, grain elevators, tile works, creamery, and stock-yards. There are eight churches, graded schools, and two banks. Pop. (1910) 1,538.

Waverly, Iowa, city, county-seat of Bremer County; on the Cedar River, and on the Chicago, R. I. & P., the Illinois C., and the Chicago G. W. R.R.'s; about 27 miles southeast of Charles City and 12 miles north of Cedar Falls. It is in an agricultural and stock-raising region. It has a large number of butter and cheese factories, condensed milk factories, canneries, a furniture factory, a creamery-supply factory, a flour mill, and agricultural implement works. The four banks have a combined capital of \$100,000 and deposits amounting to \$528,470. It has six churches. The educational institutions are Wartburg Teachers' Seminary and Academy, graded public schools, and a public library. The city owns and operates the waterworks. Pop. (1890) 1,337; (1900) 1,573; (1910) 1,205.

Waverly, N. Y., village Tioga County; on the Chemung River, and on the Erie and the Lackawanna R.R.'s; about 17 miles southeast of Elmira and 20 miles southwest of Owego. It is in a region largely devoted to farming and stock-raising. It is a shipping point for large quantities of butter, cheese, milk, eggs, poultry, and farm products. Waverly is near the coal and oil fields of Pennsylvania, and has connection by electric cars with Athens and Sayre, Pa. The two banks have a combined capital of \$100,000. It has six churches, a high school established in 1871, grammar and primary schools, an opera house, and a town hall. Pop. (1910) 4,855.

Waverly, Ohio, village, county-seat of Pike County; on the Scioto River, and on the Norfolk & W., and Ohio S. R.R.'s, 57 miles south of Columbus. It is in an agricultural and stock-raising region; and contains flour and saw-mills, tanneries, distilleries, and furniture factories. There is a high school with a school library of over 1,000 volumes. Pop. (1910) 2,100.

Wavy, the common name in the Hudson Bay region for the smaller wild geese, especially the snow-goose. See *GESE*.

Wax, a concrete, unctuous-feeling substance, which partakes of the nature of fixed oil. It is secreted by bees in constructing their hives, and is also a most abundant vegetable production, entering into the composition of the pollen of flowers, covering the envelope of the plum and of other fruits, especially of the berry of the *Myrica cerifera*, and, in many instances, forming a kind of varnish to the surface of leaves. It is distinguished from fat and resinous bodies by its not readily forming soaps when treated with alkaline solutions. Common wax is always more or less colored, and has a distinct, peculiar odor, of both of which it may be deprived by exposure in thin slices to air, light, and moisture, or more speedily by the action of chlorine. At ordinary temperatures wax is solid and somewhat brittle; but it may be easily cut with a knife, and the fresh surface presents a characteristic appearance, to which the name of waxy lustre is applied. Its specific gravity is .966. At 155° F. it enters into fusion, and boils at a high temperature. Heated to redness in a closed vessel it suffers decomposition, yielding products very similar to those which are procured under the same circumstances from oil. It is insoluble in water, and is only dissolved in small quantities by alcohol or ether. Wax appears to be a mixture of myrcin, cerotic acid, and cerolein. The name wax is now applied to substances other than, but resembling bees'-wax; these substances are partly of animal, partly of vegetable origin. In bleaching wax the wax must be melted, with a degree of heat not sufficient to alter its quality, in a caldron so disposed that the melted wax may flow gradually through a pipe at the bottom of the caldron into a large wooden cylinder that turns continually round its axis, and upon which the melted wax falls. As the surface of this cylinder is always moistened with water, the wax falling upon it does not adhere to it, but quickly becomes solid and flat, and acquires the form of ribands. The continual rotation of the cylinder carries off these ribands as fast as they are formed, and distributes them through the tub. When all the wax now to be whitened is thus formed, it is to be put upon large frames covered with linen cloth, which are supported about a foot and a half above the ground in a situation exposed to the air, the dew and the sun. If the weather be favorable, the color will be nearly discharged in a few days. It is then to be re-melted and formed into ribands, and exposed to the action of the air as before. These operations are to be repeated till the wax is rendered perfectly white, when it is cast into cakes or molded into candles.

The principal applications of wax are to make candles and medicinal ointments; to give a

polish to furniture or floors, for which purpose it is largely used in the United States; to form a lute or cement, for which it is used by chemists; and to serve as a vehicle for colors. By modern painters colors previously prepared in oil are sometimes diluted just before being laid on in a mixture of wax and oil of turpentine. This practice is much resorted to by French artists, especially in mural paintings. The object of it is to keep the painting free from that lustrous appearance which often renders it difficult to be seen properly in consequence of reflection. Wax also forms a principal ingredient in modelers' wax and gilders' wax. In the former the other ingredients are druggists' lead-plaster, olive oil, yellow resin, and whiting; and in the latter verdigris and sulphate of copper. Sealing-wax is not properly a wax at all, but is composed of resin lac and some less brittle resin. The largest consumption of wax takes place in Roman Catholic countries, where large quantities are required for the candles used in religious ceremonies.

Wax Figures.—The employment of wax in imitative art dates from a period anterior to historical times, although, according to Pliny, the art of casting it in molds was not practised previous to the time of Lysistratus, its reputed inventor, who flourished about 300 a.c., and whose productions were chiefly portraits cast in plaster molds taken from the face. Wax portraits eventually became common, and among the Romans, who placed them in the vestibules of their houses, were regarded as an evidence of ancient nobility, as none were allowed to possess such images whose families had not borne some curule magistracy. In the Middle Ages, wax was employed in the construction of images of saints and of votive images, and those who practised sorcery melted before a slow fire wax figures of the persons against whom their incantations were directed. In the latter half of the 15th century Andrea del Verrocchio and Orsino gained considerable reputation by some figures of Lorenzo de' Medici, their joint production, which consisted of frameworks of wood or skeletons for the bodies and limbs, while the heads, hands, and feet were cast in wax, painted in oil colors to counterfeit life. They were furnished with glass eyes and natural hair, and were habited in the costume usually worn by Lorenzo. The manufacture of wax figures of the size of life is still carried on to a considerable extent, but has long ceased to be considered a branch of the fine arts, no imitative skill or taste on the part of the artist being sufficient to overcome the ghastly fixedness which such images must always present, and which is the more disagreeable as the resemblance to life is closer. In the preparation of anatomical models and pathological examples, however, wax has been very advantageously employed, the invention being due to Gaetano Giulio Zumbo, a famous modeler in colored wax, who flourished in the latter half of the 17th century. In the succeeding century the celebrated collection of anatomical models in the Institute of Bologna was commenced under the direction of Ercole Lelli, the finest specimens being by Giovanni Manzoni and his wife, Anna Morandi Manzoni. In the Museum of Natural History at Florence are 15 chambers devoted to preparations by Fontana, Sushni, and other celebrated modelers; the Musée Dupuy-

WAX-FLOWER—WAY

tron at Paris is famous for its morbid specimens; and almost every considerable city of Europe now has its collection.

Wax-flower, or Madagascar Jasmine. See **STEPHANOTIS**.

Wax Insect. See **SCALE INSECTS**.

Wax, Mineral. See **HATCHETTITE**.

Wax, Vegetable, a solid, fatty substance, that may be regarded as a concrete oil, and which is secreted by many plants, sometimes in large enough quantities to be of commercial importance. It forms, on foliage, a varnish or coating, which prevents excessive transpiration or wetting of the cells; and, on twigs and flower-pedicles, by its slippery surface, keeps unwelcome insects from reaching the flowers and robbing them of their honey. The whitened under surfaces of some willow leaves and the bloom of fruit are composed of wax either in granules or rods or spread over the cuticle. The most familiar example in America of the hard fat or wax in quantity is on the bony nutlets of the wax-myrtles or bay-berries (*Myrica*). The gray-coated drupes of *M. carolinensis* clustering on the bare twigs are conspicuous in seashore regions, after the leaves are fallen; the wax clinging to their rough, granular surfaces when melted is a greenish, hard substance, sharing the balsamic odor of the plant. It was used in colonial times as a basis for candles and for a kind of soap. Other species, of other countries, furnish a similar wax, and are known as candle-berries or tallow-trees. Carnauba wax is exported from Brazil for candles and as a substitute for bees'-wax. It is the coating on the young leaves of *Corypha cerifera*, indigenous to tropical South America. The young leaves are removed and dried. The wax-granules may then be shaken off, in the form of a fine dust, melted and caked. A varnish-like exudation of wax, on the stems of two other South American palms, *Klopstockia cerifera* and *Cerroylon andicola*, the wax-palm, the latter being a tall tree, slightly thickened at the centre of the trunk and crowned by a tuft of pinnate leaves. This wax is scraped off and melted. A mixture of resin and wax results, from which the latter is extracted by boiling spirits, and is then utilizable for candles. It is, however, seldom seen in commerce. Japan wax is a wax-like, hard fat, which is largely exported from Japan to Europe, in yellowish hard cakes, with a resinous, rancid odor, and often covered with a powdery efflorescence. It is mixed with or substituted for bees'-wax, where its rancid odor is not preventive, and is extracted by several methods, such as heating under pressure or boiling from the crushed drupes of oriental species of sumac (q.v.).

Waxahachie, waks-a-hach'ee, Texas, town, county-seat of Ellis County; on the Missouri, Kansas & Texas and the Houston & Texas Central R.R.'s; about 178 miles northeast of Austin, the State capital, and 31 miles south of Dallas. It was founded in 1847. It is in an agricultural and stock-raising region, in which are produced large crops of wheat and a good quality of cotton. The manufactories are cotton-seed-oil mills, cotton compresses, and flour mills. It is a cotton centre for an extensive region; its annual cotton receipts are about 65,000 bales. The principal public buildings are the county

court-house (original cost \$150,000), the banks, churches, and schools. There are six churches, Park High School (white), a high school for colored pupils, established 1893, public elementary and private schools, and a library. There are three national banks and one trust company. Pop. (1910) 6,205.

Wax-bill, or Senegal Finch, an African weaver-bird (*Estrilda astrida*), one of the section of the family called blood-finches on account of the prevalence of red in the plumage. This has long been a favorite among cage-birds, and is sold by dealers all over the world. It is nearly 5 inches long. The beak is bright red and somewhat swollen. A bright red stripe passes between the eyes, and the middle of the breast and belly is a beautiful reddish-brown. The upper surface of the body is brownish-gray, the lower surfaces lighter, everywhere traversed by very fine blackish wavy lines; wings and tail brown. They are varied much in color by breeders, bright blue tints, even, having been developed in some. Their song is not very interesting, but they are pretty and affectionate in a high degree. Their food and care should be similar to those given to a canary.

Wax-wing, a woodland bird of the family *Ampelidae*, a small isolated group of birds of the northern hemisphere, characterized by their shrike-like beaks, silky brown plumage, tall erectile crests, and especially by the tips of the wing and tail-quills terminating in flattened scales closely resembling red sealing-wax. There are but three species, the northern or Bohemian wax-wing (*A. garrulus*); the Siberian wax-wing (*A. phanicoptera*), and the common North American cedar-bird (q.v.). The northern wax-wings make their home near the Arctic coasts of both continents, and breed there, in trees, long before the snow has disappeared in spring. Sometimes it is not seen in the United States or Central Europe for years together, then will appear in vast numbers, but very locally. These erratic movements are doubtless due to presence or absence of food, which consists of both insects and berries (the latter mainly, of course, in winter), but were regarded by the superstitious peasantry of Europe as signs of some visitation of war or pestilence to follow. All the wax-wings are cinnamon-brown, relieved by handsome markings of black, gray and yellow.

Waxy or Amyloid Degeneration. See **DEGENERATION (IN PATHOLOGY)**.

Way, Arthur S., English classical scholar; b. Dorking 13 Feb. 1847. He was fellow of Queen's College, Melbourne, Australia; was classical lecturer in Queen's College, Taunton, in 1870-6, and was the head of the Wesley College of Melbourne in 1882-92. In 1897 he became examiner in Latin to the Central Welsh board of secondary education. His publications include English verse-renderings of the 'Odyssey' (1880) and 'Iliad' (i.-xii. 1886; xiii.-xxiv. 1889); of the tragedies of Euripides (1894-8); of Horace's 'Epodes' (1898); and of Apollonius Rhodius' 'Tale of the Argonauts'; and 'Letters of Saint Paul to Seven Churches and Three Friends' (1901).

Way, in fortification, a space left for the passage round between a rampart and the wall of a fortified place.

Way, Right of. See **REALTY**.

WAYCROSS—WAYNE

Waycross, wá'krós, Gé., city, county-seat of Ware County; on the Savannah, P. & W. and the Brunswick & W. (Plant System) and Waycross A. L. R.R.'s; about 95 miles southwest of Savannah. It has manufactories of naval stores, lumber, flour, and agricultural and lumbering tools. The two banks have a combined capital of \$100,000 and deposits of about \$300,000. The educational institutions are a high school (white), established in 1899, a high school (colored), and public and private schools. Pop. (1910) 14,485.

Wayland, wá'land, Francis, American college president. b. New York 11 March 1796; d. Providence, R. I., 30 Sept. 1865. He was graduated from Union College in 1813, studied in the Andover Theological Seminary, was a tutor at Union College 1817-21; in 1821 became pastor of the First Baptist Church of Boston, and took a leading place in the ranks of American preachers, his sermon on 'The Moral Dignity of the Missionary Enterprise' (1823) being particularly well known. After holding a professorship at Union (1826-7), he became president of Brown University. During the 28 years of his administration he greatly developed the institution, and was one of the pioneers of the elective system in American universities. Subsequent to his resignation (1855) he was for a year and a half pastor of the First Baptist Church of Providence, after which he devoted himself to various kinds of religious and humanitarian effort. He was the author of many valuable works, including 'Elements of Moral Science' (1835); 'Elements of Political Economy' (1837); 'Limitations of Human Responsibility' (1838); 'Domestic Slavery Considered as a Scriptural Institution' (1845); 'Elements of Intellectual Philosophy' (1854); and 'Sermons to the Churches' (1858).

Wayland, Francis, American legal scholar, son of the preceding: b. Boston 23 Aug. 1826; d. New Haven, Conn., 9 Jan. 1904. He was graduated from Brown University in 1846, took his M. A. degree from Yale in 1872, and began law practice in Worcester, Mass., in 1850, removing in 1858 to New Haven. He was judge of probate in 1864-5, and lieutenant-governor of Connecticut in 1869. In 1872 he became professor in the law school of Yale, and in 1873 dean of the school. In 1903 he resigned the deanship. The development of the school from a minor local institution to its present condition, with adequate financial basis and wide curriculum, is due chiefly to him. He was president of several organizations, including the American Social Science Association, the board of directors of the Connecticut State Prison, the Prison Aid Association from 1872, and the Organized Charities Association of New Haven from 1878. He was prominent as a writer and speaker on sociological and charitable topics and criminology, and was joint author, with his brother, H. L. Wayland, of the 'Memoir' of President Wayland (1867).

Wayland the Smith (Ger. Wieland, wé'lánt; Norse, Völundr; A. S. Weland), a hero of old Teutonic saga. His myth assumes numerous forms. It appears in Scandinavian, Anglo-Saxon, and German poems. The name probably signifies the 'skilful' or 'artful' one. Wayland seems to be a deification of the smith, whose calling was considered among the highest. Epi-

odes in the story narrate that Wayland was, like Vulcan, lame, and, like Daidalos, manufactured wings and could fly. These are thought, however, to have been late introductions from the classic mythology. In France, too, Galans the Smith was known. Simrock employed the various legends in his epic 'Wieland der Schmied' (1835). The megalithic monument in Berkshire called 'Wayland Smith's cave,' with the character Wayland, empiric, farrier, and pedlar, is familiar through Scott's 'Kenilworth.' Consult Maurus, 'Die Wielandsage in der Literatur' (1902).

Wayne, wá'n, Anthony, American soldier: b. East Town, Pa., 1 Jan. 1745; d. Presque Isle (Erie), Pa., 15 Dec. 1809. At 18 he became a land-surveyor. He was an intimate friend of Franklin, and early took an active interest in public affairs. Having married and settled to farming (1767), he was elected to the Pennsylvania convention and legislature in 1774, served on the committee of safety, and in 1775 raised a regiment, with which he took part in the campaign against Canada. He fought with distinction, and was wounded at the battle of Three Rivers 3 Jan. 1776; held Ticonderoga till May 1777, and after receiving the commission of brigadier-general joined Washington in New Jersey; led a division at Brandywine 11 September, and commanded the right wing and led the attack at Germantown 4 October. He made a dashing raid on the British lines in the winter of 1777-8, carrying off a great quantity of supplies, and on the night of 15 July 1779 achieved the most brilliant of the American victories in the storming of Stony Point, for which he received a gold medal and the thanks of Congress. He became a popular hero, and his nickname of 'Mad Anthony' was as much a tribute to his energy and valor as it was a denotation of his recklessness in action. By a bayonet charge he rescued Lafayette in Virginia in 1782; made a daring attack on the whole British army at Green Spring (6 July), and defeated the British and Indians in Georgia. On the surrender of Charleston, S. C., by the British it was occupied by Wayne, 14 Dec. 1782. He was made brevet major-general 10 Oct. 1783, retired from the army in 1784, and became a member of the Pennsylvania legislature. He was a member of the convention of that State which ratified the Federal Constitution in 1787. Later he settled on a Georgia plantation presented to him by the State in return for his military services; and from Georgia, in 1791, he was sent to Congress, but in a contest during the next year his seat was declared vacant. In April 1792, he was made commander-in-chief of the American army, with the rank of major-general. In 1793 he took the field against the Indians in Ohio, whom he finally defeated at Maumee Rapids or Fallen Timbers, and he forced them to conclude the treaty of Greenville (1795), which gave a large tract of territory to the United States. His death occurred while he was engaged in completing this service. A monument was erected to him at Waynesboro, Pa., in 1809. Consult the 'Lives' by Armstrong (1834) and Moore (1845); Wayne's 'Regimental Orderly Book' on the northern campaign, edited by J. Munsell (1859); Stille, 'Wayne and the Pennsylvania Line' (1893); Roosevelt, 'Winning of the West,' Vol. IV. (1899-94); and Spears, 'Anthony Wayne' (1903).

WAYNE—WAYNESSBURG COLLEGE

Wayne, Neb., city, county-seat of Wayne County; on the Chicago, Saint Paul, Minneapolis & Omaha Railroad; about 95 miles north by west of Lincoln and 85 miles northwest of Omaha. It is in an agricultural region, in which the principal productions are wheat, corn, sugarbeets, and potatoes. Wayne makes extensive shipments of grain, hogs, cattle, hay, and vegetables. It has Nebraska Normal College (private), a high school, and public graded schools. The four banks have a combined capital of \$230,000 and deposits amounting to about \$650,000. Pop. (1910) 2,140.

Waynesboro, wānz'bār-ō, Ga., city, county-seat of Burke County; on the Central Railroad of Georgia; about 100 miles northwest of Savannah and 30 miles south of Augusta. It was laid out as a town in 1783, and in 1888 was incorporated as a city. The chief manufactures are cottonseed-oil mills, wagon factory, agricultural implement works, and a cotton compress. It has seven churches, one public high school or academy, and Waynesboro Academy (a private high school), and elementary public schools. A battle was fought here during the Revolutionary War, and one during the Civil War. Pop. (1910) 2,729.

Waynesboro, Pa., borough in Franklin County, on the Mount Alto and West Maryland R.R.'s; about 48 miles southwest of Harrisburg. It is the commercial and industrial centre of quite an extent of territory. The chief manufacturing establishments are machine shops, creameries, ice-machine and engine works, plow factory. In 1900 (government census) Waynesboro had 61 manufacturing establishments, capitalized for \$3,084,774. The number of employees was 1,103, and the annual cost of raw material used in the manufactories was \$1,072,213; the value of the products (annually) was \$2,731,039. The borough is near South Mountain and Antietam Creek. The Confederate army passed through Waynesboro on the way to and from Gettysburg. Pop. (1910) 7,199.

Waynesboro (Va.), Battle of. On 27 Feb. 1865 Gen. Sheridan started from Winchester, Va., on his final campaign up the Shenandoah Valley, under instructions from Gen. Grant to destroy the Virginia Central Railroad, the James River canal, capture Lynchburg, if practicable, and join Gen. Sherman, wherever he might be found in North Carolina, or return to Winchester. He had Custer's and Devin's divisions of cavalry and two sections of artillery, about 10,000 officers and men, the whole commanded by Gen. Merritt, his chief of cavalry. At Mount Crawford, 1 March, he was met by Rosser's cavalry which was promptly dispersed, and 2 March he reached Staunton, which had been abandoned by Gen. Early, who had fallen back eastward to a ridge west of and near Waynesboro, where he could muster only Wharton's two small brigades of infantry, Nelson's battery of six guns, and Rosser's cavalry, in all not over 1,800 men. Merritt followed from Staunton, and late in the afternoon, after some artillery-firing, three of Custer's dismounted regiments moved around Early's left flank, between it and South River, while two of his brigades charged his front. Early's men made but a feeble resistance, and broke in a disorderly rout, hotly pursued by the Union cavalry through Waynesboro and as far as the South Fork of the

Shenandoah and to Greenwood Station, where five guns were captured and several loaded cars burned. Merritt took as prisoners 1,450 officers and men, and captured 11 guns, with horses and caissons complete, 200 loaded wagons, and several battle-flags. Gens. Early, Long, Wharton, Lilley, and Rosser, with a few men, escaped. From Waynesboro the prisoners and captured artillery were sent back to Winchester, under guard of 1,600 men. Early's army had disappeared, and Sheridan moved unmolested to the Virginia Central Railroad, which was destroyed for several miles. The swollen condition of the rivers made it impossible to join Sherman, and Sheridan determined to destroy still more thoroughly the railroad and James River canal and then join Grant in front of Petersburg. He divided his command, sending one part to the James River canal, which it destroyed as effectually as the other part destroyed the railroad. This done, he moved to White House on the Pamunkey River, where he arrived on 19 March 1865, and thence to the army in front of Petersburg. Consult: 'Official Records,' Vol. XLVI.; Pond, 'The Shenandoah Valley in 1864'; Sheridan, 'Personal Memoirs,' Vol. II.; Early, 'Last Year of the War for Independence'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV. E. A. CARMAN.

Waynesburg, wānz'bērg, Pa., borough, county-seat of Greene County; on Ten Mile Creek and on the Waynesburg & Washington Railroad; about 44 miles south of Pittsburg. It is in an agricultural and stock-raising region, and in the natural-gas and oil belt. It has flour mills, a foundry, a planing mill, carriage factory, machine shop, and creameries. It is the seat of Waynesburg College (Cumberland Presbyterian). The five banks have a combined capital of \$675,000 and deposits amounting to about \$2,500,000. Pop. (1910) 3,545.

Waynesburg College, located at Waynesburg, Pa. It was chartered in 1850 and first opened to students in 1851. It was established by and is under the control of the Pennsylvania Synod of the Cumberland Presbyterian Church, and the trustees are elected by this synod. In 1902 the board of trustees was increased from 11 to 21 members, and the Alumni Association empowered to submit 12 nominations, from which 6 trustees shall be elected. The college for many years labored under serious financial difficulties, and it was not until 1898 that an adequate endowment was obtained, which was increased in 1900. Since that time the curriculum has been extended, especially in the study of the sciences, and the equipment greatly improved. The college offers three regular courses, classical, literary, and scientific, which lead to the degrees of A.B., B.L., and B.S. Greek is required for the A.B. degree. These courses all include some electives in the work of the last two years, the list of electives from which the student may choose differing in each course. The degree of A.M. is conferred for graduate work; courses leading to the Ph.D. degree have been discontinued. In addition, the college maintains a preparatory department, a normal department, a conservatory of music, and a school of oratory. The college adopted the system of co-education at the first, and has found it most successful. The students maintain two literary societies and a Young Men's and a Young Women's Christian

Association. The buildings include the main building and Hanna hall, a dormitory. There are well-equipped chemical and biological and physical laboratories, recently established. The library in 1910 contained 6,535 volumes, and the productive funds amounted to \$75,000. The students numbered 325, and the faculty 14.

Ways and Means Committee. See FINANCE; SEMATS, U. S.

Wazan, wā-zān', Morocco, an inland town, picturesquely situated on the steep northern slope of a two-peaked mountain, in the hill country 90 miles southeast of Tanger. It is a sacred city of refuge, and a place of pilgrimage, the headquarters of the grand shérif, the spiritual ruler of Morocco. The principal buildings are the great mosque and the tombs of a long line of shérifs. The trade is, as elsewhere in Morocco, mainly in the hands of the Jews. Pop. 20,000. Consult Watson, 'A Visit to Wazan' (1880).

Waziristan, wā-zē-rī-stān', the country of the Waziris, Northwestern India, a mountainous region situated west of the Suliman range, north of British Baluchistan, and east of Afghanistan. It is now partly included in British India, and has at various times been the scene of military operations owing to the depredations and raids of the Waziris on the caravans traversing the Gomul Pass. It is a mountainous country, with much fine scenery, and a delightful climate except in some of the valleys. The Waziris, a portion of whom are known as Mahsuds, are a hardy race of Afghans. It is estimated that they number about 44,000 fighting men. Some of them have settled peaceably within British territory, where they cultivate 27,000 acres and pay a revenue of \$4,500. Their crops are wheat, maize, and barley; they raise horses and sheep, and iron and wood are exported.

Wea (contraction of *Wayutasaki*, "Eddy people"), a tribe of the Algonquin stock of North American Indians, belonging to the Miami confederacy. When first known to the whites, in 1672-1703, they were in Wisconsin, but they seem to have gradually drifted southward, and in 1701 one of their villages was on the site of the present Chicago, Ill., and in 1719 their chief village was on the Wabash below the mouth of Wea Creek, in Indiana. They were hostile against the whites in western Virginia, in which their country was situated, but they finally signed the celebrated treaty of Greenville in 1795, and in 1820 sold their last lands in Indiana and moved with the Piankashaws to Illinois and Missouri. In 1832 they again sold their lands and the main body moved to Kansas, whither a few of their number had already migrated. In 1854 the rapidly decreasing Weas and Piankashaws united with the Peorias and Kaskaskias of the Illinois confederacy; at this time their population aggregated 250, largely mixed-bloods. In 1868 they moved to the Neosho in Indian Territory, where they have since remained. The Miami number 110 and the Peoria 185, but the population of the Weas is not separately recorded.

Weakfish, or Squeteague, a spiny-rayed fish of the genus *Cynoscion* and family *Sciaenidae*. It has no teeth on the vomer or palate bones, but numerous ones in the jaws, one or two in the front of the upper jaw, having the form of

elongated canines; the head is convex, supported by cavernous bones; the air-bladder has a horn on each side projecting forward. The genus is chiefly American, with about 15 North American species. The common weakfish (*C. regalis*) is 1 to 2½ feet long, brownish blue above, with irregular brownish spots, and tinged with greenish and banded in the young; the sides silvery, abdomen white, and iris yellow; lower fins orange; a single row of very small teeth in the upper jaw, and a double series in the lower; dorsals separated, and the second, with the caudal and anal, mostly covered with scales. This is one of the most abundant fishes along the entire Atlantic coast from Cape Cod to Florida, but there have been times when the invasions of bluefish have driven them from parts of the coast. The name originated from the little resistance it makes when taken, and from the ease with which the delicate structure of the mouth enables it to break away. This is the name most employed on the New Jersey coast, while in New England the Indian name "squeteague" is usual, and in the South sea-trout is applied to this and to the spotted *Cynoscion*. On the New Jersey coast it appears early in the spring, being most abundant toward the end of July, and disappears late in the autumn; it is a greedy biter, and is easily taken by any soft white bait, affording great sport for about an hour on the flood tide; it swims in shoals near the surface, and requires a line slightly if at all leaded. In summer it is abundant about the mouths of rivers, where the water is brackish, and sometimes ascends far up, having been taken in the Hudson above Sing Sing; it is taken by seines and pound-nets in large quantities; when caught it makes a croaking sound, also heard when the fish is at the bottom. The flesh is wholesome and well flavored, but so quickly gets soft that it does not rank high in the market. The air-bladder makes excellent isinglass for culinary purposes. The spotted weakfish (*C. nebulosus*) is conspicuously marked with round black spots above and the soft-dorsal fin is not scaly. It is more southern than the squeteague, and is sometimes called spotted trout. Other related species occur in West Indian waters and on the Pacific coast.

In 1901, 23,496,383 pounds of weakfish, valued at \$558,653, were taken in the fisheries of the Middle States, Maryland, and Virginia, and in 1898 the New England States yielded 4,691,188 pounds, worth \$108,945.

Wealden, wēl'dēn, the name given to certain delta-deposits of the Cretaceous (or Chalk) system, from their great development in the weald of Sussex, England. Weald means in Old English a wood or forest, and the name is applied to a tract of country lying between the north and south downs of Kent and Sussex. The recognized geological name of this subdivision of the Cretaceous system is the Neocomian, from the old Latin name of Neuchâtel in Switzerland. This stage in the south of England, and thence eastward across Hanover, consists of a mass of sand and clay, sometimes 1,800 feet thick, representing the delta of a river. Only a portion of this delta remains, but as it extends in an eastern and western direction for a distance of at least 200, and from north to south less than 100 miles, its total area may have been 20,000 square miles, indicating a very large river. The stream not improbably descended

WEALTH—WEASEL

from the north or northwest. It carried down the drifted vegetation of the land, with occasional carcasses of the iguanodonts and other terrestrial or amphibious creatures of the time. Beyond the area overspread by the sand and mud of the delta, the ordinary marine sediments accumulated, with their characteristic organic remains. From Yorkshire, England, they stretch eastward through northwestern Germany, and are found at the base of the Cretaceous system through France into Switzerland. See **GEOLOGY**.

Wealth, in political economy, a term applied to all objects possessing value. Such objects are defined, in general, as useful, transferable, and limited as to supply. There is some confusion regarding the sense in which the word is employed by various authors, but standard usage limits the term to external objects, excluding all personal attributes. Wealth is frequently confounded with money. See **POLITICAL ECONOMY**; **VALUE**.

Wealth of Nations, An Enquiry into the Nature and Causes of the, a famous work by Adam Smith, published in 1776. It is a treatise especially designed to show the wisdom and justice of free trade among nations, and forms the foundation of the modern science of political economy. The style of the work is diffuse, and to a very large extent it drew from the work already done in France by the economists of the "Encyclopédie" school. Five English editions of the work appeared during its author's life, and it was translated into many modern languages.

Wealth of the World. The total wealth of the world, while not exactly known, has been estimated at \$500,000,000,000. This is probably an underestimate of the actual amount of money and property in civilized and semi-civilized lands. Of this total, the greater part is owned by Americans and Europeans. The United States has somewhere near \$100,000,000,000, or about one fifth of the whole. Among foreign nations the total wealth has been estimated as follows:

Great Britain	\$50,000,000,000
France	48,000,000,000
Germany	40,000,000,000
Russia	32,000,000,000
Austria-Hungary	27,000,000,000
Italy	16,000,000,000
Spain	12,000,000,000
Scandinavia	7,000,000,000
Belgium	5,000,000,000

The percentage of public debt per capita of European countries has been estimated for 1909 as follows:

COUNTRIES	Population	Debt per capita
Austria-Hungary	50,400,000	\$21.6
Austria	29,824,000	32.2
Hungary	20,575,000	55.4
Belgium	7,452,000	89.8
Bulgaria	4,221,000	22.5
Denmark	2,692,000	25.9
Greece	2,632,000	60
Holland	5,225,000	77
Italy	34,370,000	76
Norway	2,330,000	98
Portugal	5,423,000	15.9
Rumania	6,772,000	41.5
Servia	2,825,000	36.6
Spain	19,713,000	22.2
Sweden	5,378,000	25.7

The total wealth per capita of various countries is as follows:

Great Britain	\$1,442
France	1,337
Germany	799

Russia	\$ 296
Austria-Hungary	499
Italy	485
Spain	548
Belgium	739
Portugal	417
Greece	485
Australia	1,228
United States	1,125
Denmark	1,704
Canada	949

Weaning, the accustoming of an infant to food other than its mother's milk, or the disengaging of a child from the habit of nursing. In normal cases it is now deemed desirable to continue nursing for nine or ten months after birth. With children who are healthy, and cut their teeth early, weaning may begin earlier than with weak, sickly children. It should never be attempted during sickness, nor, unless absolutely necessary, in hot weather. It is best for both mother and child to bring it about gradually. By so doing the secretion of milk in the former is slowly diminished, and those complaints which arise from sudden weaning are prevented; while the child is gradually accustomed to other kinds of sustenance, and the restlessness and want of sleep, which are so troublesome in sudden weaning, are avoided. Both during the weaning and for some time after it no food should be given to the child except what is very easy of digestion, and more fluid than solid, and in particular what has no stimulating qualities, nor any that will tend to create acidity, or produce other marked changes in the organic functions. See **INFANCY**.

Weare, wär, Meshech, American colonial leader: b. Hampton Falls, N. H., 16 June 1713; d. there 14 Jan. 1786. He was graduated at Harvard in 1735; studied theology and entered the ministry, which he gave up for the practice of law; was repeatedly sent to the legislature, and in 1782 was speaker. His later appointments included that of commissioner to the Albany Congress (q.v.) in 1774, justice and (1777) chief justice of the superior court of judicature. He was also colonel of a militia regiment, and when the Revolution opened was appointed chairman of the Committee of Public Safety. Upon the reorganization of the State judiciary he was placed at its head. He raised troops for defense against Burgoyne, whose invasion he materially aided in repelling. In 1776, under the temporary constitution, he was elected president of the State, and was annually re-elected until 1784. Under the new constitution he was again elected president, but resigned before the expiration of his term.

Weasel (*Putorius noveboracensis*), a fur-bearing mammal (q.v.), typical of the family *Mustelidae*. The body is elongated and slender, the head long, the legs short, the muzzle rounded and the tail short and slender. The feet have each five toes and are digitigrade and unwebbed. There are 34 teeth and the sectorial or flesh-tooth lacks an internal tubercle. The anal glands are developed and secrete a strong-smelling substance. The weasel attains a length of from 12 to 15 inches, of which the tail makes nearly one third. The male is larger than the female. Above the color is brown, below white or pale yellow, the terminal one third of the tail black. In winter the fur becomes more or less white, but this change is complete only in the north and does not affect the black of the tail; in this white phase the animal is called an

WEATHER BUREAU — WEATHER MAPS

ermine (q.v.). The common weasel, in one or other of its varieties, inhabits the entire eastern United States, westward to Minnesota, south to North Carolina and north to Canada; and is replaced in most other parts of North America by more or less closely related species and in Eurasia by others, of which the Siberian ermine is its nearest ally. Owing to its retiring and nocturnal habits it is often, quite unknown to most people, plentiful even in the vicinity of large cities, where it renders efficient service in the destruction of vermin. The weasel is a highly courageous animal, and makes war on rats, mice, hares and rabbits, birds, and many other small animals. During the summer it devours insects, but appears never to partake of a vegetable diet. Many instances are on record in which these animals have spontaneously attacked horses and cows, and they seem nearly at all times to exhibit an utter indifference to the proximity of man. They are especially fond of eggs, and rob hen-roosts and the nest of every wild bird which they find. Their mode of killing their prey is characteristic—since they usually fasten on to the neck of their victim, and hold firmly on while they suck the blood; next they eat the brains and only then the flesh. Like most of their near relatives they often kill much more than they require for food. They hunt by scent and are tireless in pursuit. Few animals are so active, and the slowness of their bodies enables them to explore every hole and hiding-place of their prey. Weasels live in holes under stone walls, rocks and trees, in burrows captured by force from ground-squirrels and woodchucks, in hollow stumps, etc. A nest of dried leaves and grasses is constructed and about five young are born in a litter. Consult: Coues, 'Fur-bearing Animals' (Washington 1877); Merriam, 'Synopsis of the Weasels of North America' (Washington 1896).

Weather Bureau, United States. See **Meteorology.**

Weather Maps. Meteorology has, of late years, made rapid progress. In 1870 the United States established its Weather Bureau for gathering the facts that pertain to this branch of science. We were not the first, or the original promulgators of the present system, but we were the first to establish the system upon a grand basis, by which we have accomplished such satisfactory results. Our extended territory is most favorable. The main portion of the United States, covering in round numbers, an area of 3,000 miles from west to east, and some 1,500 miles north and south. The first maps were crude affairs, but gradually the improvement and perfection came. At first, on the map, the two grand centres or factors high and low were not tracked. They were simply indicated. After a while it was seen that there was a movement of these factors of high and low barometer, from the west toward the east, or contrary to the movement of the sun. "Barometer" being a long word, on the map it is not used, but it is the while understood. When the word high is used it stands for high barometer, and when the word low is used low barometer is understood. So the terms high and low have come to stand for high and low barometer. High is a cold, dry factor, and cold in proportion to its intensity, while low is a wet factor, and cold or warm in proportion to its latitude.

The movements of these factors high and low are from the west toward the east—on general lines. At first the term "general lines" may seem like a loose method of referring to these factors, but when we come to understand the subject, we readily see that this term "general lines" is most appropriate and definite; there is nothing loose as to thought in this term. The highs and lows enter somewhere in the west—south or north—and travel toward the east; at times much after the manner of a vessel at sea, against a head wind, tacking, in order to reach a certain point to the windward. These highs and lows do not tack, but they often take similar lines; hence the reference to this detail of navigation in order to illustrate the lines that these factors take in their course over the country and around the world. There are four general points at which the lows enter, and one general point at which they pass off the Atlantic coast toward the east. Which the superior factor? it may be asked. The reply is, neither—one is as much the superior as the other; they are parts of one stupendous system, whereby nature re-animates and invigorates the atmosphere of our earth. We speak of the lows first because they are the storm centres; yet the highs likewise perform their part; they furnish material that is an essential feature of the storm. The two work together and produce all the changes that come under the head of what we so commonly call our "Weather System." The lows enter the territory of the United States at four different points. But it must not be assumed that these points are always the same, and that they are like the great gates of the ancient city. One point of entrance is in the extreme Northwest, in the neighborhood of Puget Sound, and the other, or the one we may call the second, is in the Southwest, at the head of the Gulf of California. The third, we first find on the borders of the Gulf of Mexico, and evidently comes up from some point on the lower Pacific coast of Mexico. When our system is extended so as to cover Mexico, as the United States is now covered with stations, we shall be in position to determine the course of these lows before they enter our territory. From this direction they evidently come. The fourth set are first revealed to us when they make their appearance in the southeast of the lower coast of Florida. These lows, coming from this southeastern quarter, may at first cause some doubt as to the course of the storm, but when we come to study the system, as now revealed to us, there will be seen to be no inconsistency in the statement that the general movement is from the west toward the east. When we come to have our system of stations established through Mexico and the West Indies, what we arbitrarily term the third and fourth, may be one and the same, or this fourth may be an independent centre, coming up from the Spanish Main. As to these two herein designated as the third and fourth, we must at present, in regard to them, remain in darkness. This darkness, though, should at once appeal to the scientific world to plead for the essential stations through Mexico and the West Indies. In time we evidently shall have stations all over the world; then we shall have a weather map that will enlighten us as to the system of the whole. We cannot study the tidal system of the earth in a mill-pond, nor

WEATHER MAPS

even in the greatest of inland seas. We must have access to the oceans of the world. So with meteorology, we cannot study the beautiful system in a small or circumscribed territory. We must have an extended territory, and the more extended the better the results. The lows that enter at the northwest gate sometimes from this point travel due east—toward the Great Lakes and along the St. Lawrence Valley, to the Atlantic Ocean. At other times they will, from this point of entrance, travel toward the southeast, even down to the mouth of the Mississippi, and from there take a course toward the northeast, leaving the Atlantic coast at about the same point as the one that took the direct course toward the east. The low that enters at the southwest, also may go on a line as nearly east, until it reaches the vicinity of the mouth of the Mississippi; then from this point it may travel toward the north and join the low that came from the vicinity of Puget Sound; or it may move along the shores of the Gulf States, even as far as the Atlantic seaboard, then move northward toward the banks of Newfoundland. The third or the low from Mexico often takes a similar course, after it has reached the mouth of the Mississippi. But those from the West Indies are probably the most erratic, and more than any other set of lows they, at times, for considerable distances, will travel along a line that is quite contrary to the general direction. The one that in 1902 produced the great and terrible storm at Galveston was of the most erratic character. It came up from the West Indies, and was first revealed to us off the lower coast of Florida, that is, within the lines of the United States. From this point, instead of going toward the northeast, as do the greater number of these storms, for 24 hours it traveled due west, covering the distance of some 1,100 miles in 24 hours—an erratic direction and a phenomenal speed. On an average the lows travel from 300 to 400 miles a day, but here was one that traveled 1,100 miles in one day. Why? it may be asked. If the reader will consult the map of the day on which this storm first appeared off the lower coast of Florida, he will see that an extensive high covered the territory of the southeast section of the United States, which was like the great mountain that at times turns the direction of a stream. Because of the location of that high, the low could not pass toward the north, so it must take the direction of the least resistance, and that was toward the west. It had a clear field; there was nothing in its way. It flew across the Gulf from the east toward the west. Then it turned toward the north, veering more and more toward the northeast and joined the path of the lows that pass off the coast at Newfoundland. So while its direction was for a while toward the west, its general direction was toward the east. One thing that has operated against meteorology is the fact that the courses of the lows and highs are so peculiar, as is also their speed. So by some it is not regarded as an exact science. If the movements of the highs and lows could be worked out by some process of arithmetic, or even the higher mathematics, then a certain class would have more interest in it. But we must take nature as we find it. It is a fact that the highs and lows do travel as they do. We cannot change this; the laws that govern them must stand.

From fall to spring the greater number of the highs that enter the Pacific coast centre on Cape Mendocino, and this accounts for the peculiar climate of the Pacific coast; as there is the while the central high and the low to the north and the low to the south of it. Having knowledge of this, we readily understand the peculiar climatology of the Pacific coast. Then if we will study the map and see the course of the majority of the lows that travel across the country, it will not be difficult to understand the climatology of the eastern section of the United States. Indeed, without the knowledge we obtain from the weather map, it is not possible to understand the climatology of any section. With this knowledge, all that comes under the head of climatology is exceedingly easy to comprehend. Until we had the weather map, the so-called "Texas norther" was a mystery; now the explanation of this phenomenon is as plain to us as why the locomotive moves over the land or the steamship over the seas. When the conditions occur that produce the "Texas norther" the map reveals to us that the high that entered at Cape Mendocino, instead of moving directly east, or toward the northeast, moved toward the southeast and covered the territory of Texas, and later the territory of the Gulf States.

It was one of these highs that a few years ago was so destructive to the orange trees of Florida. Let it be borne in mind that the wind is always from the high toward the low; not in a direct, but in a curved line; for the reason that low is the centre toward which the winds move. The winds from the four points of the compass, north, east, west, and south, must come together at this point, or the centre low, and as they approach the centre these winds necessarily react upon each other and deflect each other toward the right, as we face the centre of low. So the term "general" as to the winds is as pertinent as is the direction of the factors high and low. The highs and lows travel on general lines from the west toward the east; the winds travel on general lines from the high toward the low. Before we had the weather map to throw light on this subject there was much crude thought about the movement of the winds. It was often stated that the winds moved over the surface of the earth in epicycles, and even to this day persons who have not heeded the lessons taught by the weather map claim that the winds during the fierce storm travel in epicycles, and to these storms they have given the name "cyclone." The weather map relegates the term "cyclone" out of the list of words—it is a misnomer. And yet, when the fierce hurricane or the fierce summer local occurs, and evidence is found of objects along the path of the storm being twisted about in a most erratic manner, the supposition of the past was that the winds moving in epicycles produced this effect. But such is not the case. Water rushing down a steep incline does not take such a course. From time to time it may meet with some firm object like a great rock, and thereby an eddy or whirlpool may be caused, but if the obstacle was not in the way the water would flow on its course, and the course would be as straight as the nature of the valley or incline would permit. So with the winds. Winds that are moving at the rate of from 50 to 100 miles an hour do not stop to

WEATHER MAPS

take epicycles. In the summer-local the wind moves along a very narrow path, and after moving a short distance becomes, as it were, a thing of life, and often assumes a huge serpentlike shape—a bolt moving over the surface of the earth. If there is nothing in its way it moves along on a straight line. But if there is some firm object in its course it may be deflected, right, left, or over, as the case may be; it may pass over some objects, while others it will hit and send them rapidly whirling off toward the right or left, depending upon which side the blow from the bolt is given. Then in this connection of late there has been intimated, evidently from European sources, the term "cyclone and anti-cyclone." By the "cyclone" agent or power they mean the low that causes the fierce winds to rush toward it; to the high, which is the magazine of the airs that rush toward this low centre, has been given the name "anti-cyclonic." Might as well call a hill an anti-valley. At times some persons ask, why should the highs and lows move as they do, and because they cannot understand the why, they take little interest in the subject as a whole. No more than any other medium can the weather map explain the first cause, but it can, if we will properly study it, lead us up as near to the first great cause along its line as can any other medium along any other line of science. In all departments of nature there are facts that we must accept, whether they do or do not make clear to us all the mysteries of cause and effect. There is one thing certain, the more facts with which we are familiar the greater our chances for comprehending the laws that govern all departments of nature. To be indifferent in regard to obtaining facts, and then to be indifferent and even to condemn such labors as lead up to the better interpretation of nature and nature's laws, seems most absurd. And yet this is the position of many. Because we cannot, at present at least, tell what is the cause and why the peculiar action of these two factors high and low, they refuse to take interest in the subject as a whole. In all departments we sooner or later come to the point where we must fall back upon theory. While this is not final it oftentimes serves as a provisional structure that later on leads up to grander results.

Why should high and low have the characteristics peculiar to them? Where facts fail to reveal any further light it is then well to resort to theory, and in plausible theory there is often much satisfaction. There is no better way for a plausible theory as to low than in imagination to put ourselves back at the very beginning, when the sun began to shine upon the earth and to cause it to revolve. It could not turn in but one direction, and it might as well turn or revolve in one direction as the other. The Grand Architect of the Universe evidently saw fit to have it turn on its axis as it does—toward the east. Possibly there would be no difference in the conditions that follow, whether it turned east or west. It must turn toward the sun. When the earth first began to move some one point, or a belt of centres, became the point or points where the heat of the sun was concentrated; much like the action of the double-convex lens that is so commonly called a "sun-glass." The heat of the sun acting upon the waters of the earth produces clouds. At the point of concentration there is, on the part of

nature, an attempt, at least, to produce a vacuum which causes a movement of the surrounding airs toward that point. Soon the direct heat of the sun is shut off from this point. The while the earth is turning and another and another point is exposed to the concentration, and so on until the circle of the earth is complete. Toward these points of concentration, designated by the term low, the surrounding airs are brought. The propelling force, we term the winds, is the result of the concentration at low. After reaching these points, the airs becoming heated, ascend, to a point a number of miles above the earth, where they take the lines of the boiling water in the pot—convection. These heated airs spread outward from the centre in all directions. As the atmosphere at these higher altitudes is cold, the coldness is gradually imparted to these warmer airs that have ascended to this high elevation. Becoming cooled, they lose their buoyancy and therefore descend. By heat they have ascended; by cold they descend, and where they descend they build up heavy banks of pure airs, airs containing a minimum of moisture; and these points become great magazines of pure air, and we designate them as highs. So all over the world are the lows and the highs. On the surface the movement of the airs is from the high toward the low; above this it is reversed, the movement being from the low toward the high, which readily accounts for the direction of the light cirrus clouds, at times seen moving along a line directly opposite from the movement of the winds at the surface of the earth.

So the weather map has even a wider and deeper or higher revelation than at first it appears to have. It becomes a veritable Jacob's ladder that connects that which is below with that which is above. It reveals to us the motion of the atmosphere above the earth, as well as the movement along the surface. Then if we will go a little further in our investigation, it reveals to us how nature makes or produces electricity, and how simple are the elements and the process. First, we start with the heat power of the sun acting upon water. This causes what is called evaporation, which is simply so much water combining with so much heat, whereby miniature globules or balloons are produced. Herein is the heat and water, which in due time reaches the condition or form of force which we designate as electricity, which is a subtle yet powerful product of heat that comes from the relatively north low. The wind being from the high toward the low, when low is to the north, say moving along the line of 50° N. L., all to the south thereof will be warm because of the south winds, which are by this north low being brought toward the north. The clouds cover the point low, but the heat power of the sun shines upon the upper side of these clouds, thereby super-heating them. As the heat power at low increases, the clouds are not only brought there in greater masses, but in combination with the heat and friction the explosion of the confined gases takes place; a noise that we term thunder is produced, and the confined heat, now highly intensified, escapes. This we term lightning, and the whole process is termed electricity. So we often hear the term "electric storm." In one sense it may be a storm of this character, but in reality it is only the sub-result of a storm. It does not always accompany the storm, nor

WEATHER MAPS

even all sides of the same storm. To the south of the centre, at times it will be present, while to the north of the centre it will be absent. What is known by the name "thunder storm" is far more frequent in the warmer than in the colder months. In the colder months even the north low will not produce this peculiar storm condition.

There are two classes of storm, the general storm and the local. The general storm is where the precipitation takes place over a wide area, from 500 to even 1,000 miles in diameter. The local is peculiar to the warmer months, and is called local for the reason that it takes place at points here and there, to the south of the main storm centre. These are of a more fierce nature than the general storm. They don't last long, sometimes less than an hour. But there is no need here to say how long they last, for that is something patent to all, and the public as a rule does not care to be told something about which, without effort, they know so much.

The hurricane is a fierce general storm, where the barometer is very low, reaching a point of 28 inches pressure. The tornado is the fierce local storm. In winter there is a much greater difference between the pressure of the high and the low than in summer. In the winter the high will, even in northern sections, reach a pressure of 31 inches. But generally, through the central portions of the United States, say, centering upon the line of 40 N. L., the pressure will be 30.7. This will be a great pressure and will produce intense cold. A winter low will often be 29.4 and at times as low as 28. During the winter months over the area of the United States there is often a difference of three inches, while in the summer the normal difference will not be more than 30 many tenths; that is, the low will be 29.9 and the high 30.2. At times when a severe storm is raging the low pressure may go down to 29.4. But ordinarily during the summer months there is very little difference between the pressure of these two factors.

It is often asked how far ahead can we prognosticate the weather. There are men claiming their ability to forecast the weather for months ahead. If one will study the weather map and see the variety thereon revealed, the various shapes that the highs and lows take, their peculiar and oftentimes surprising course, he will not be apt to have much confidence in anyone's claim for forecasts, say, beyond four or five days. There are times when it is easier to predict what will be for four or five days in advance than at other times to predict with any certainty beyond 24 hours or for that minor part of time. If the map is regular, that is, well defined and extensive highs and lows, we may safely forecast the weather for a number of days, perhaps a week. But the first thing we know, there is a change in the conditions. Instead of there being a few well-defined lows and highs, the atmosphere is all broken up into a number of small areas, thereby making the problem of prognostication far more difficult.

In order to produce the changes in our meteorological system, heat is required; there is not sufficient heat in the moon to produce the necessary effect—only the heat power of the sun is sufficient for the purpose. In the colder months the gradients or lines of equal barometric pressure are much nearer together than dur-

ing the warmer months, and if one will become familiar with this it is a good and concise way of describing the weather. The gradients are near or far apart, as the case may be. It will be found to be a very expressive term. In the northern States, that is, States, say north of 40 N. L., most all of the passing lows in the cooler months produce snow. At times there may be a succession of north lows, whereby the atmosphere is heated to such an extent as to cause the precipitation to be in the form of rain rather than snow. But during the winter months, the highs being so intense and following the lows, the atmosphere has little opportunity to become heated, so that from the passing low there is snow rather than rain, but in the States midway between the north and the south line, say, below 40, where there is oftentimes much snow, the precipitation in this form in winter is only from a low that is passing along a line from the Gulf States toward the north. In this southern section the north lows cause rain rather than snow. The low in the south causes the north wind in that quarter, and the north winds in winter are sufficiently cold to cause the precipitation to be in the form of snow. At times as far south as New Orleans they have snow, but only when the juxtapositions of the highs and lows are favorable. In the midway States the storm often commences with snow and ends with rain, for the reason that the low that has brought the storm or snow is the while traveling toward the north, and this being the case the south winds that follow in the wake of the low so increase the temperature that rain is apt to follow or the snow soon to melt.

In discussing the weather problem some writers have made the statement that it would seem that it was full time that the wise men in this department should, ere this, have discovered some way by which we can control or regulate the weather, and by their remarks imply that those who know so much about the weather must be wanting in their knowledge of the subject, or in the practical application thereof, because they have not thus far been able to even suggest any plausible plan whereby to control the weather. Claims have been made for some men that they have by various mechanical appliances in miniature produced rain, and have by bombarding the sky caused precipitation. To those unacquainted with the revelations of the weather map this seems plausible. But their miniature performances, within some enclosed apartment, is of no value, and as for bombarding the sky it was a few years ago extensively tried and failed—failed even when a low was passing very near the locality of the firing. In their plan they did not consider the fact that there was no moisture to speak of within an area of high or the clear sky centre. In order to regulate the weather the first thing to do would be to regulate the sunshine; the next step to cause the earth to reverse its direction and change its path. The third step would be to regulate the highs and lows, where and how they shall enter the territory of the continent, the lines on which they shall travel, the outlines of the gradients, and the contour of the centres of the highs and lows. After they have succeeded in doing this, then they may be in position to develop some plan whereby they may think it pos-

WEATHER.

A delicate mechanism in the Weather Bureau, Washington, D. C., which records sunshine, rainfall, wind, approaching storms, etc.

WEATHER SIGNALS

sible to carry out their ideas along this line. But they must first change and remodel the whole face of nature.

While low is the storm centre, that is, the centre that causes the winds, and thereby concentrates the clouds, the precipitation does not always take place at this centre, but oftentimes before it reaches the centre, or about midway between the high and the low. When the clouds become sufficiently heavy they precipitate and do not wait until they have reached the centre. The centre is the active agent in bringing them toward a central point; sometimes they pass on to the centre, and other times they do not, and when they do not there will even be no rain at the centre that has been the means of bringing the clouds toward that point. In the fall of the year we have a number of weeks of fine weather—cool, yet not severely cold—cool nights and perhaps frosty mornings, but during the day it will be mild, hazy and even smoky. The conditions that produce this effect may graphically be described under the head of gradients far apart—moderate and extensive areas of high and low, with the low to the north, say on a line of 50 N. L., and the moderate high covering the area of the Southern States, say to the south of the old Mason and Dixon's line. This phenomenon, under favorable conditions and slight variations, also produces the fine atmospheric effects, that come under the head of "red-sky" morning as well as evening.

The high produces the clear sky, with a minimum of moisture, and the north low produces the warmth, or moderate heat, for reason of the south winds. This fall condition, with the gradients far apart, gave rise to the beautiful and ideal term "Indian summer"; and as the mild winds were from the south, the "Sweet Southwest," with the Indian became an ideal of a glorious condition which they thought, in some mysterious way, to be associated with the locality whence the balmy breezes came. They did not know, and we did not know until we had the weather map, that those balmy breezes from the south are caused by the gentle low far to the north. So the "Indian summer" is a happy combination of the more delightful northern and southern forces in the fall of the year, when the gradients are far apart.

The term "equinoctial storms" seems to be difficult to eradicate. But, if at the seasons of the year when these storms are supposed to occur, one will consult the weather map, he will see that it does not then indicate, over the whole country any extraordinary condition of the highs and lows. At the time of the vernal and autumnal equinox there may be a low coming up from the West Indies, or from Mexico, traveling toward the northeast; if so, it will produce a storm along the Atlantic coast. But the lows that produce these storms often approach and pass without regard to the position of the sun in the ecliptic. If there was any truth in this old idea, then there should at these times, be some peculiar condition of the factors high and low, whereby there would be a general storm all over the country, and not merely a local disturbance along the coast. What gave rise to this belief is evidently the lows that, during the spring and fall, come up from the South, and at times produce the severe storms along the Atlantic seaboard. But there is nothing regular or general about these storms.

Sometimes we have them along the Atlantic coast and sometimes not, and as to time, they have no connection with the sun "crossing the line." Without regard to the vernal or autumnal equinox the highs and lows move over the country in their peculiar way, and they have no respect for special points in the equinox, or even for "sun-spots," the moon, or the conjunction of planets. For the so-called "equinoctial storm" there is no foundation, and it has no connection with scientific truth. This idea had its origin in older times, before we had the facts in the case, but the facts as now known place the whole subject of the weather upon an entirely new basis.

While on the land the paths of the lows are very irregular, and oftentimes take a zigzag line; on the ocean they seem to travel on very straight lines. Their course on the land is evidently due to the irregularity of the earth's surface—hills, valleys, and water in the form of lakes and rivers; while on the ocean it is all one condition practically—one great extensive plain of water, or only one element. Then on the ocean we have not the essential stations that we have on the land, therefore it is not so easy to be exact in our observations. The storms over the ocean are tracked by the observations made upon the great ocean steamers that ply between Europe and America. From the evidence of their "logs" the data are formulated, and the tracks of the storms laid down.

The statements herein made are based upon the observations made in the northern hemisphere. Up to date no such observations have been furnished by the southern hemisphere. But from what we know of nature, the same laws that govern one hemisphere must govern the other; though to the south of the equator, the polar or cold winds are reversed. There, the south winds must be the cold ones, while the winds in that hemisphere from the north must be the warm ones. Otherwise we think that the conditions must be the same. If we desire to know anything, and all, about the weather, the weather map is the only source. On this wonderful illuminator are revealed all the phenomena connected with what we term the weather. By this map and by it alone, can we comprehend the mysteries in the department of nature that we class under the head of Meteorology.

ISAAC P. NORRIS,
Washington, D. C.

Weather Signals. In the United States Weather Bureau, are signals for announcing the approach of storms. They are as follows:

A cautionary signal (displayed only at stations on the Lakes).—A red flag (eight feet square) with white centre (four feet square) indicates that the winds expected will not be so severe but well-found seaworthy vessels can meet them without danger.

A storm signal.—A red flag (eight feet square) with black centre (three feet square) indicates that the storm is expected to be severe.

A red pennant (five feet hoist and 12 feet fly) displayed with the flag indicates east winds—that is, from northeast to south, inclusive, and that the storm centre is approaching.

A white pennant (five feet hoist and 12 feet fly) displayed with the flag indicates west winds—that is, from north to southwest, inclusive, and that the storm centre has passed.

When red pennant is hoisted above cautionary or storm signal, winds are expected from the northeast quadrant; when below, from the southwest quadrant.

When white pennant is hoisted above the cautionary or storm signal, winds are expected from the northwest quadrant; when below, from the southwest quadrant.

Night signals.—By night a red light will indicate

WEATHERFORD—WEAVING

and winds; a white above a red light will indicate west winds.

The Information Signal consists of a red pennant and indicates that the displayman has received information of a storm covering a limited area, dangerous only for vessels about to sail to certain points. The signal will serve as a notification to shipmasters that important information will be given them upon application.

Weatherford, weth'er-fôrd, Texas, city, county-seat of Parker County; on a branch of Trinity River, and on the Gulf, C. & S. F. (Atchison, Topeka & Santa Fe), the Weatherford, M. W. & N., and the Texas & P. R.R.'s; about 65 miles west of Dallas. It was settled in 1850 by persons from east Texas and the older States. In 1856 it was incorporated, and in 1858 chartered as a city. It is in an agricultural and stock-raising region; wheat, cotton, and corn are among the principal productions. In 1900 (government census) the city had 83 manufacturing establishments. The chief manufactures are oil mills, cotton mills, cotton compress, ice factory, machine shops, and the light-plant. There are 10 churches. The educational institutions are Texas Female Seminary (Cumberland Presbyterian), Weatherford College (M. E. South), a high school, established in 1885, Saint Joseph's Academy, Hughey and Turner School, public and parish graded schools. The three banks have a combined capital of \$150,000. The government is vested in a mayor and a board of aldermen consisting of eight members. The majority of the inhabitants are American born; about 7 per cent are of Mexican and French descent and 3 per cent are colored. Pop. (1900) 5,074.

AARON SMITH,
Editor, 'Democrat.'

Weatherly, weth'er-ll, Frederic Edward, English song writer and barrister: b. Portsea, Somerset, 4 Oct. 1848. He was graduated from Oxford in 1871 and was called to the bar of the Inner Temple in 1887. He is widely known as the writer of popular songs, many of which have been given musical settings. Among them are 'Nancy Lee'; 'Polly'; 'Three Old Maids of Lee'; 'Darby and Joan.' Of his published volumes mention may be made of 'Muriel and Other Poems' (1870); 'Wilton School' (1872); 'Oxford Days' (1879); 'Rudiments of Logic' (1879); 'Questions in Logic, Progressive and General' (1883); 'Two Children' (1884); 'Lays for Little Ones' (1898).

Weaver, wé'vër, Aaron Ward, American naval officer: b. District of Columbia, 1 July 1832. He was graduated at the United States Naval Academy in 1854; became lieutenant in 1855 and in 1858-9 cruised along the African coast in the sloop Marion, and returned in command of the prize slave Ardemes. He served in the Union army with distinction through the Civil War, made commander in 1866; captain in 1876; and rear-admiral in 1893; and was retired in September of the year last named.

Weaver, James Baird, American political leader: b. Dayton, Ohio, 12 June 1833; d. Des Moines, Iowa, 6 Feb. 1912. He was graduated from Ohio University Law School 1854; and began practice in Iowa. In 1861 he entered the Union army, was promoted colonel in 1862, and brevetted brigadier-general in 1865. In 1866-70 he was district attorney 2d judicial district of Iowa; and in 1867-73 assessor of internal revenue 1st Iowa district. For some time he was editor of the *Iowa Tribune*, published at

Des Moines. He took an active part in the organization of the Greenback party, and was elected to Congress on its ticket in 1879, serving one term; in 1880 he was the Greenback candidate for President, receiving over 300,000 popular votes. Later he was affiliated with the People's Party, was a delegate to the National Convention in 1892, and was again nominated for the presidency, receiving over 1,000,000 popular votes. Since 1895 he has lived in Coffey, Iowa; and was elected mayor of that city in 1902. He wrote 'A Call to Action' (1892).

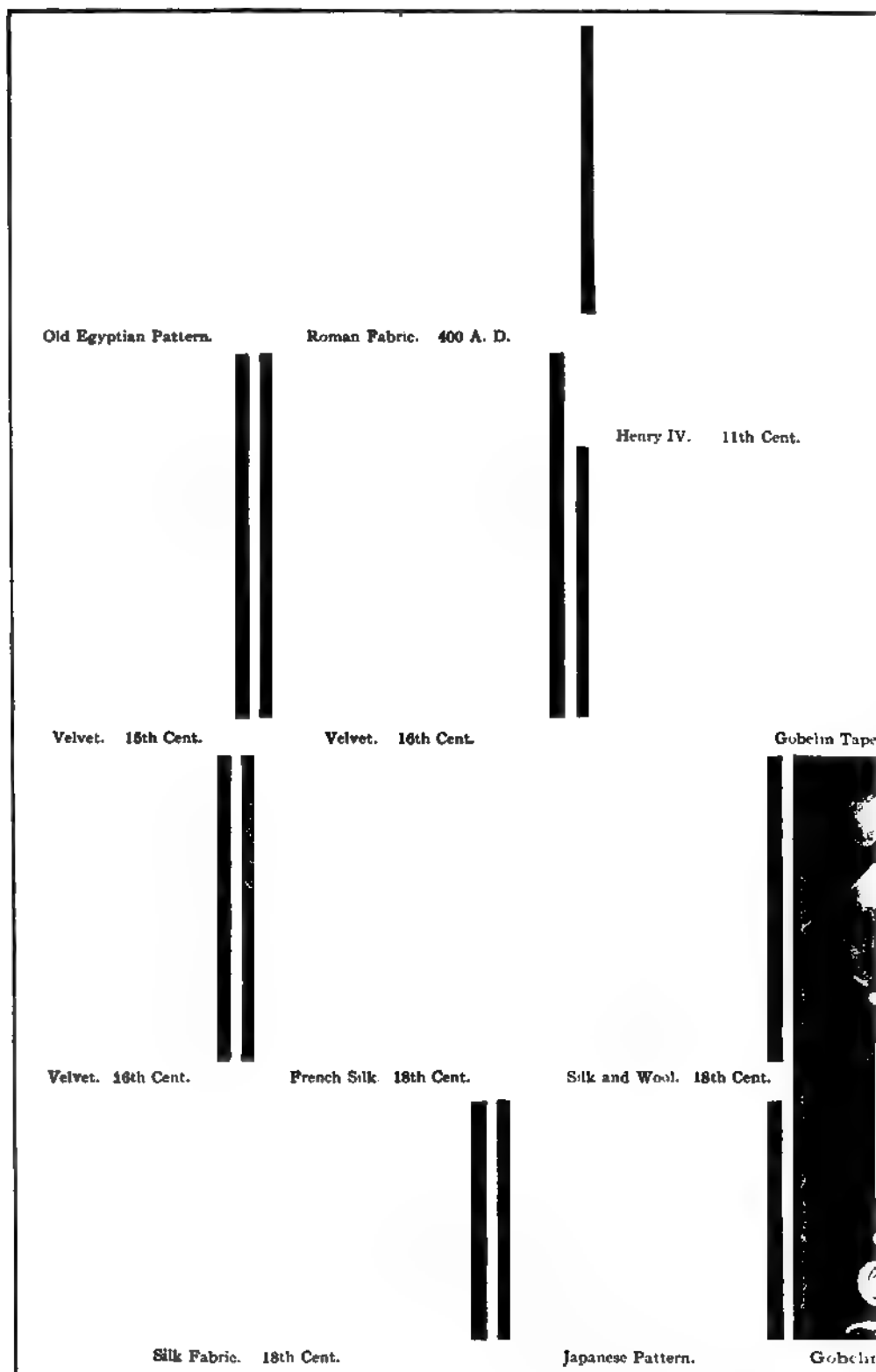
Weaver-bird, a bird of the family *Ploceidae* remarkable for their nests. The family is a large one and is confined to the warmer parts of the Old World, Africa being particularly rich in species. Weaver-birds closely resemble large finches, with somewhat elongated bodies, moderate wings, which have the outer primary quill better developed than in the *Fringillidae*, long tails, and very bright plumage, the latter often varied in the breeding season. Yellow and yellowish red are the prevailing tints, but species occur in which black, red, white, or gray predominates. The weaver-birds are extremely social, and many of the species live in large colonies during the period of incubation.

The nests of the various species differ considerably in shape and general structure, some (as the genus *Oriolus*), building a separate nest for the male, while the female sits in another on her eggs, till relieved by her mate; others again contain more than one chamber, as that of the golden weaver-bird (*Ploceus galbula*); while the social weaver-birds (*Phalacrocorax socius*) construct an umbrella-like roof, under which from 800 to 1,000 separate nests have been found. But in all cases fibres, slender twigs, or blades of grass are the materials employed, the whole being tightly woven, after having been rendered more flexible and adhesive by the application of saliva. In some cases the birds of a pair take positions on opposite sides of the structure and the fibres are passed through and through from one to the other. The nests themselves consist of a more or less globular portion, elongated into a tube below, with the entrance at the bottom or at the side. They are very generally suspended at the extremities of branches, and often over water, probably as affording security against monkeys, snakes, and other enemies. The Mahali weaver (*P. taha*) is said to insert thorns into its nest, as a further protection against marauders. A Philippine species (*Ploceus Philippinus*) builds flask-shaped nests of fine roots suspended mouth downward by long ropes of similar construction from the boughs of trees. Consult Bartlett, 'Monograph of the Weaver-birds' (Maidstone 1888).

Weaving, the art of interlacing yarn threads or other filaments by means of a loom, so as to form a web of cloth or other woven fabric. In this process two sets of threads are employed, which traverse the web at right angles to each other. The first set extends from end to end of the web in parallel lines, and is commonly called the warp; while the other set of threads crosses and interlaces with the warp from side to side of the web, and is generally called the weft or woof. In all forms of weaving the warp threads are first set up in the loom, and then the weft threads are worked into the warp, to and fro, by means of a shuttle. It

WEAVER BIRDS (*Ploceus franciscanus*)

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WEAVING



nt. Italian Silk Fabric of 13th Cent.



Velvet Patterns. 16th Cent.



apestry. 17th Cent.

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was by this fundamental process of interlacing two sets of thread in looms of simple mechanism that the mummy cloths of Egypt, the fine damasks and tapestries of the Greeks and Romans, the Indian muslins, the shawls of Cashmere, and the famed textile fabrics of Italy and the Netherlands were produced.

Hand Looms.—Until comparatively modern times all weaving was effected by means of the hand loom. This loom, in its latest form, consists of a frame of four upright posts braced together by cross-beams, the centre beam at the back being the warp beam, the beam in front being that upon which the web is wound, while just below this, in front, is the breast-beam for the support of the weaver at his work. At the top of the loom is an apparatus by which the heddles are lifted or lowered by means of treadles under the foot of the weaver. These heddles consist of two frames, from which depend cords attached by a loop or eye to each thread in the warp. As these threads are attached to the frames, alternately, it follows that when one heddle is raised every second thread in the warp is also raised, while the remaining threads are depressed; and this is called shedding the warp. When the warp threads are thus parted there is left a small opening or shed between the threads, and it is through this opening that the weaver drives his shuttle from side to side. The shuttle, which is hollow in the middle, contains the weft-thread wound round a bobbin or pirn, and as the shuttle is shot across the web this weft-thread unwinds itself. When the thread is thus introduced it is necessary to bring it to its place in the fabric. This is accomplished by means of the lay or batten, which is suspended from the top of the loom, and works to and fro like a pendulum by an attachment of vertical rods at each side called the swords. Attached to the lay is what is called the reed, which is a sort of comb having a tooth raised between every two threads of the warp, and so by driving up the lay after a weft-thread has been introduced the weaver strikes home that thread to its place in the cloth.

The Fly Shuttle.—A great improvement was made upon the hand loom when John Kay about 1740 invented the fly-shuttle, as it was called. This enabled the weaver to drive the shuttle both ways with the right hand by means of a cord attached to a box or trough placed at each end of the shuttle-race, which impelled the shuttle to and fro at each jerk of the cord. But the most important improvement was made on the hand-loom by Joseph Jacquard of Lyons, who, in 1801, invented an apparatus by which the most intricate patterns could be woven as readily as plain cloth. This is accomplished by an ingenious arrangement of hooks and wires, by means of which the warp threads are lifted in any order and to any extent necessary to make the shedding required by the pattern. The order in which these hooks and wires are successively lifted and lowered is determined by means of a series of pasteboard cards punctured with holes, the holes corresponding to a certain pattern and the cards passing successively over a cylinder or drum. The hooked wires pass through these holes and lift the warp-threads in an order which secures that the arranged pattern is woven into the fabric. When the pattern is extensive the machine may be provided with as many as 1,000 hooks and wires.

Power Looms.—Another development was made in the art of weaving by the invention of the power loom by the Rev. E. Cartwright in 1784. In the power loom, which has been gradually improved and adapted to steam and electric power, the principal motions of the old method of weaving, such as shedding the warp threads, throwing the shuttle, and beating up the thread, are still retained. The frame of the power loom is of cast iron, and motion is communicated to the loom by means of a shaft, the stroke of the lay being made by cranks attached to the driving shaft, while the shuttle is thrown by means of a lever attachment at the centre of the loom. Although the principle of the loom is the same in all kinds of weaving, yet there are numberless modifications for the production of special fabrics. The lappet loom is one suitable for weaving either plain or gauze cloths, and also for putting in representations of flowers, birds, or the like.

Cross Weaving is a term applied to that process in which, as in gauze weaving, the warp-threads, instead of lying constantly parallel, cross over or twist around one another, thus forming a plexus or interlacing independent of that produced by the weft.

Double Weaving consists in weaving two webs simultaneously one above the other, and interweaving the two at intervals so as to form a double cloth. Kidderminster or Scotch carpeting is the chief example of this process.

Pile Weaving is the process by which fabrics like that of velvets, velveteens, corduroy, and Turkey carpets are produced. In the weaving of these fabrics, besides the ordinary warp and weft, there is what is called the pile-warp, the threads of which are left standing in loops above the general surface till cut, and the cutting of which constitutes the pile.

Webb, Alexander Stewart, American soldier and educator: b. New York 15 Feb. 1835. He was graduated from West Point in 1855, was assistant professor of mathematics there in 1857-61, and at the outbreak of the Civil War became major of the 1st Rhode Island Infantry. He participated in the defense of Fort Pickens, was at the first battle of Bull Run, served in the Peninsular campaign and in 1863 became brigadier-general of volunteers. At Gettysburg he assisted in repulsing Pickett's charge and received a Congressional medal of honor in recognition of his gallantry. He was engaged in the Rapidan and the Wilderness campaigns, was wounded at Spottsylvania, and upon his return to duty was appointed chief-of-staff to General Meade. He received brevet rank as major-general of volunteers in 1864, and was brevetted brigadier-general of regulars in 1865. In 1866 he was promoted lieutenant-colonel, was brevetted major-general in the regular army in 1869, and in 1870 at his own request received an honorable discharge. He was president of the College of the City of New York in 1869-1903, and wrote: 'The Peninsula. McClennan's Campaign of 1862' (1882). Died 12 Feb. 1911.

Webb, Aston, English architect: b. London 22 May 1849. He was educated in private schools, was articled to Messrs. Banks and Barry, architects, and began practice in 1873. He was the architect for the completion of the Victoria and Albert Museum and the Royal College of Science, South Kensington; the Britan-

nia Naval College, Dartmouth, and the architectural accessories for the Victoria Memorial before Buckingham Palace. He has designed many churches, commercial structures, and mansions, and, with E. I. Bell, the Victoria Courts, Birmingham; the Birmingham University and the new schools of Christ's Hospital. He was president of the Architectural Association in 1884, and vice-president of the Royal Institute of British Architects 1893-7.

Webb, Charles Henry (pen name "JOHN PAUL"), American journalist and humorist: b. Rouse's Point, N. Y., 24 Jan. 1834; d. N. Y. City 24 May 1905. He was on the staff of the *New York Times* (1860-3), and going to California in 1863 founded the 'Californian,' San Francisco, which he edited till 1866. Subsequently he contributed to the *New York Tribune* humorous articles signed 'Jean Paul.' He invented an adding machine, but was better known by his burlesque dramas, among which are 'Lif-fith Lank' (1867), and 'Saint Twel' Mo' (1868). Other works by him are: 'John Paul's Book' (1874); 'Parodies, Prose, and Verse' (1876); 'Vagrom Verse' (1889); 'More Vagrom Verse' (1901).

Webb, James Watson, American journalist and author: b. Claverack, N. Y., 8 Feb. 1802; d. New York 7 June 1884. He entered the United States army as 2d lieutenant, and became adjutant in 1825; served in the West under General Scott; and resigned from the army in 1827. In that year he became editor of the *Morning Courier* in New York; this was united with the *Enquirer* as the *Courier and Enquirer*, which he edited until 1861, when it was merged in the *New York World*. At first he supported Jackson but later as vigorously opposed Jackson's measures, and made the *Courier and Enquirer* one of the leading Whig papers. In 1851 he was appointed engineer-in-chief of New York State, and given the rank of major-general. After refusing an appointment as minister to Turkey, he was appointed minister to Brazil in 1861, which office he held until 1869. In 1865, when he was in France for a time, he negotiated a secret treaty with the emperor providing for the removal of the French troops from Mexico. He wrote 'Altowan, or Incidents of Life and Adventure in the Rocky Mountains' (1846); 'Slavery and its Tendencies' (1856); and 'National Currency' (1875).

Webb, Samuel Blatchley, American soldier: b. Wethersfield, Conn., 15 Dec. 1753; d. Claverack, N. Y., 3 Dec. 1807. He joined the Revolutionary army immediately after the battle of Lexington, was engaged at Bunker Hill, became aide to General Putnam, and in June 1776 was appointed private secretary and aide-de-camp to Washington, receiving rank as lieutenant-colonel. He was engaged at the battles of Long Island, White Plains, Trenton, and Princeton, and in 1777 took command of the 3d Connecticut regiment which he had organized, equipping it almost entirely from his own funds. He accompanied General Parson's expedition to Long Island in 1777, and on 10 December was captured with his command. He remained a prisoner until 1780, when he was appointed to succeed Baron Steuben in command of the light infantry, with brevet rank of brigadier-general. He was one of the 16 founders of the Society of the Cincinnati in 1783, and in 1789 held the

Bible on which Washington took the oath as first President of the United States.

Webb, Sidney, English political economist and Fabian socialist: b. London 13 July 1859. He was educated in Switzerland and at the City of London College, and in 1878 entered the civil service, holding several different positions chiefly in the colonial office, and resigning from the service in 1891. He was admitted to the bar in 1885. He was one of the founders of the Fabian Society (q.v.), and in 1891 was elected to the London County Council as a candidate endorsed by the Fabian Socialists. He is lecturer on political economy at the London School of Economics and Political Science, and is a member of the Economic Faculty of London University. He has written 'Socialism in England' (1890); 'The Eight Hours' Day' (1891, with Harold Cox); 'The London Programme' (1892); 'Labor in the Longest Reign' (1897); and in collaboration with his wife, Beatrice Potter Webb, 'The History of Trade Unionism' (1894); 'Industrial Democracy' (1897), and 'Problems of Modern Industry' (1898). 'The History of Trade Unionism' is an exhaustive account of the origin and progress of the English labor unions; 'Industrial Democracy' shows the organization and ideals of the modern British trades unions. These two works form the most valuable contribution to the history of English labor; and written with sympathy and forcible directness, well express the power and vitality of the labor movement.

Webb City, Mo., city in Jasper County; on the Missouri R., the Saint Louis & S. F., and the Kansas City, F. S. & M. R.R.'s; about 10 miles south by west of Carthage, and known with its neighbor, Cartersville, as one of the "Twin Cities." It was first incorporated in 1876, three years after the discovery of extensive deposits of lead ore, zinc being discovered several years later; and in 1890 became a city, its government being administered by a mayor and a council of 10 members. It is important as a mining town, the Webb City-Cartersville mining district having in 1894-1904 produced lead and zinc to the value of \$23,000,000. It boasts the distinction of having no miners' unions. Its deposits of ore are near the surface and are believed to be almost inexhaustible. It is the centre of a rich agricultural and fruit-growing section. The Webb City Iron Works are second largest in southwestern Missouri, and the city has also lumber and flour mills. It has 12 churches, 5 graded elementary schools, a high school (cost of building \$30,000), and is the seat of the Great Western Normal School and Business College. The waterworks system cost originally \$100,000. It has two banks (combined capital \$700,000); and two daily newspapers. Pop. (1910) 11,817.

Webber, web'b'er, Charles Wilkins, American author: b. Russellville, Ky., 29 May 1819; d. Nicaragua 11 April 1856. In early youth he passed several years of adventurous life on the Texan frontier, and later settled in New York where he was for a short time assistant editor of the 'American Review,' and a prolific contributor to, that and the 'Democratic Review' and other periodicals, in which appeared in a serial form his 'Old Hicks the Guide,' and other tales of backwoods life and adventure. In 1849

he published the 'Gold Mines of the Gila.' His remaining works comprise the 'Hunter Naturalist' (1851); 'Spiritual Vampirism' (1853); 'Tales of the Southern Border' (1853); and 'Wild Scenes and Song Birds' (1854), forming a second volume of the 'Hunter Naturalist.' In 1856 he joined an expedition to Nicaragua in aid of William Walker (q.v.), and was killed in a skirmish.

Webber, Samuel, American college president: b. Byfield, Mass., 1759; d. Cambridge, Mass., 17 July 1810. He was graduated at Harvard in 1784, subsequently entered the ministry, and in 1787 was appointed university tutor of mathematics. In 1789 he was appointed to the chair of mathematics and natural philosophy, which he retained until the death of President Joseph Willard in 1804, when he became his successor. He died while holding this office. He was one of the commissioners appointed to determine the boundary between the United States and the British provinces, and published 'A System of Mathematics' (1801).

Weber, wēb'ér, Adna Ferrin, American statistician: b. Springville, Erie County, N. Y., 14 July 1870. He was graduated from Cornell in 1894, studied social science in Europe, was deputy commissioner of labor statistics of New York 1899-1901, and has been chief statistician of New York State Labor since 1901. He has published 'The Growth of Cities in the 19th Century' (1899); and statistical reports on labor.

Weber, wā'b'ér, Ernst Heinrich, German physiologist: b. Wittenberg, Germany, 24 June 1795; d. Leipsic, Germany, 26 Jan. 1878. He was educated at Leipsic, was appointed professor of comparative anatomy there in 1818, and of physiology in 1840. He originated the formula known as Weber's Law (q.v.) and wrote: 'Anatomia Comparativa Nervi Sympathici' (1817); 'Lehre vom Bau und von der Verrichtung der Geschlechtsorgane' (1846); 'Annotationes Anatomice et Physiologicae' (1851); etc.

Weber, Georg, German historian: b. Bergzabern, Rhenish Bavaria, 10 Feb. 1808; d. Heidelberg 10 Aug. 1888. He was educated at Erlangen, traveled extensively, and was director of the normal school at Heidelberg in 1848-72. His writings, which include: 'Lehrbuch der Weltgeschichte' (1847); 'Geschichte der deutschen Litteratur' (1847); 'Allgemeine Weltgeschichte für die gebildeten Stände' (15 vols. 1857-80); etc.

Weber, Karl Maria (Friedrich Ernst), BARON VON, German composer: b. Eutin, Grand Duchy of Oldenburg, 18 Dec. 1786; d. London 5 June 1826. He was a pupil of J. P. Heuschkel of Hildburghausen, attaining great skill as a pianoforte virtuoso and much proficiency in the technique of composition; and continued his studies with Michael Haydn at Salzburg, and at Munich with Kalcher (harmony and composition) and Valesi (singing). His opera, 'Das Waldmädchen,' was produced with but moderate success at Freiberg, though more fortunate at Chemnitz and (in 1805) at Vienna. A second opera, 'Peter Schmoll und seine Nachbarn,' first presented at Augsburg (1803) met with no particular approval. Early in 1803 he went to Vienna, and there that curious genius, the Abbé Vogler, was for a year his instructor. By Vog-

ler's aid, he secured the post of kapellmeister of the opera at Breslau (1804). He displayed great ability as an organizer and director, but resigned in 1806, and became musical director to Prince Eugene of Würtemberg at Karlsruhe, Silesia. In 1807 he entered the service of Duke Louis of Würtemberg at Stuttgart as private secretary, and in 1808-10 was working on his first larger opera, 'Silvana,' the libretto of which was to a large extent based on that of his earlier 'Waldmädchen.' He was falsely charged with fraud, and despite all lack of evidence against him, was perpetually banished from Würtemberg 26 Feb. 1810. Then he went to Mannheim, where his first symphony was most favorably received, and his piano-playing was also very successful; and thence to Darmstadt, where he once more became a pupil of Vogler. His comic operetta, 'Abu Hassan,' was completed in 1810 and given at Munich, and 'Silvana,' with additions, gained adequate recognition at Berlin in 1812. It was not, however, until 1813 that Weber held an important appointment; in that year he was made kapellmeister of the Prague opera, and there proved himself the first of the great German musicians to be conspicuous also as a conductor. His administration of marked success was brought to a close by his giving it up in 1816. His chief compositions of this period were settings of Körner's songs, and the cantata 'Kampf und Sieg,' founded on the battle of Waterloo. In 1816 he went to Dresden, where previously Italian opera had held undisputed sway, to organize the new venture of German opera; and soon he had attained, except among a few partisans, an unqualified victory. The appointment was confirmed for life, and he was frequently summoned to direct the music of the chapel royal. He became widely known with the presentation of his opera, 'Der Freischütz,' at Berlin 18 June 1821, which was quickly echoed elsewhere, being simultaneously given in London in three different places. Few operatic works, it is said, have equaled it in immediate triumph. 'Euryanthe' did not meet similar approval at Vienna (1823), though appreciation was duly encountered in Dresden, Leipsic, and Berlin. On the commission of Charles Kemble of Covent Garden, London, he wrote 'Oberon' to an English libretto by J. R. Planché, himself learning English to be able to work to better effect. He conducted the first 12 performances, and after a reception which almost surpassed that of the 'Freischütz,' played at numerous concerts. With the 'Freischütz,' which struck a distinctively national note, Weber became the founder of what is known as the romantic school of German opera. He has been claimed as a predecessor of Wagner in adapting his music to the dramatic requirements, and the use of leading motives. In his operatic works he apparently preferred legendary and supernatural elements, which he could make musically effective. Though his operas are the best known of his writings, he did musicianly and even brilliant work in the direction of Lieder and pianoforte compositions. Consult: Jähns, 'C. M. von Weber: Eine Lebensskizze' (1873); the biographies by Rau (1865); Benedict (1881); Reissmann (1882); and Gehrman (1899); also Benedict, 'Musiciens du Temps Passé' (1893), and the article by Spitta in Grove's 'Dictionary,' Vol. IV. (1889).

Weber, Max Maria von, German civil engineer, son of Karl Maria von Weber (q.v.): b. Dresden, Saxony, 25 April 1822; d. Berlin, Germany, 18 April 1881. He studied engineering in Dresden and in England, and in 1850 entered the civil service of Saxony. He went to Vienna in 1870, where he was engaged in the extension of the Austrian railway system and in 1878 to Berlin on a like service. He wrote extensively, not only on technical themes, but in the field of general literature. His writings include: 'Schule des Eisenbahnwesens' (1857); 'Karl Maria von Weber: ein Lebensbild' (1864-6); 'Nationalität und Eisenbahnpolitik' (1876); etc., besides the posthumously published 'Vom rollenden Flügelrad' (1882), to which is added a biography by M. Jähns.

Weber, Wilhelm Eduard, German physicist, brother of E. H. Weber (q.v.): b. Wittenberg 24 Oct. 1804; d. Göttingen 23 June 1891. He was educated at Halle, was professor of physics at Göttingen in 1831-7, and occupied that chair at Leipzig in 1843-9, after which he resumed his chair at Göttingen. He was associated with his brothers and with Gauss in various publications concerning physics, and made valuable researches in the fields of electricity and magnetism. He also published a series of essays, 'Elektrodynamische Massbestimmungen' (1846-67). Consult Heinrich Weber, 'Wilhelm Weber' (1893).

Weber, wé'bér, a river of Utah, whose headwaters are on the west slope of the Uinta Mountains. It flows northwest through fertile lands and through a series of cañons; and after a course of nearly 200 miles it enters Great Salt Lake. The famous Weber Cañon is the gorge made by this river where it breaks through the Wasatch Mountains. The Union Pacific Railroad passes through this gorge. The descent in places is most rapid, and the consequent water-power is extensive. At Ogden, the mean volume of water is about 2,000 cubic feet a second. The Weber is much used for irrigation. The river has built up at Ogden a large delta which extends into ancient Lake Bonneville (q.v.).

Weber's Law, so called from E. H. Weber (q.v.), who, after a long series of experiments on the sensations of sight, hearing and touch, formulated the law which has since gone by his name. The principle of the law is that, in order that the sensational difference may remain unchanged, the increase of stimulus must maintain the same proportion to the intensity of the preceding stimulus, or, in order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression.

Web'ster, Daniel, American orator and statesman: b. Salisbury, N. H., 18 Jan. 1782; d. Marshfield, Mass., 24 Oct. 1852. Of the generation of American statesmen that followed those of the Revolutionary period, few will live as long in the memory of the people, and none as long in the literature of the country, as Daniel Webster. His figure rises above the level of his time like a monument of colossal proportions. His father, a Puritan of stern and sterling character, had, as a backwoods farmer in New Hampshire, been an Indian fighter while New England had an Indian frontier, a soldier in the French war, and a captain in the Revo-

lutionary army. His high standing among his neighbors made him a judge of the local court. Ambitious for his children, he strained his scanty means to the utmost to give his son the best education within reach, first at Exeter Academy, then at Dartmouth College. From his earliest days Daniel was petted by good fortune. His seemingly delicate health, his genial nature, and his promising looks, put, in the family circle, everybody at his service, even at personal sacrifice, and such sacrifice by others he became gradually accustomed to expect, as a prince expects homage.

At the academy and the college he shone not by phenomenal precocity, but by rapid progress in the studies he liked,—Latin, literature, and history. He did not excel in the qualities of the genuine scholar,—patient and thorough research, and the eager pursuit of knowledge for its own sake; but he was a voracious reader, assimilating easily what he read by dint of a strong memory and of serious reflection, and soon developed the faculty of making the most of what he knew by clear, vigorous, affluent, and impressive utterance. At an early age, too, he commanded attention by a singular charm of presence, to which his great dark eyes contributed not a little; and notwithstanding his high animal spirits, by a striking dignity of carriage and demeanor,—traits which gradually matured into that singularly imposing personality, the effect of which is described by his contemporaries in language almost extravagant, borrowing its similes from kings, cathedrals, and mountain peaks.

His conspicuous power of speech caused him, even during his college days, to be drawn upon for orations on the Fourth of July and other festive days. The same faculty, reinforced by his virtue of knowing what he knew, gave him, after he had gone through the usual course of law study, early successes at the bar, which soon carried him from the field of legal practice into political life. He inherited Federalism from his father, and naturally accepted it, because he was a conservative by instinct and temperament. Existing things had a *prima facie* claim upon his respect and support, because they existed. He followed his party with fidelity, sometimes at the expense of his reason and logic, but without the narrow-mindedness of a proscriptive partisan spirit. In the excited discussions which preceded and accompanied the War of 1812, he took an active part as a public speaker and a pamphleteer. Something happened then, at the very beginning of his public career, that revealed in strong light the elements of strength as well as those of weakness in his nature. In a speech on the Fourth of July, 1812, at Portsmouth, N. H., he set forth in vigorous language his opposition to the war policy of the administration; but with equal emphasis he also declared that the remedy lay, not in lawless resistance, but only in "the exercise of the constitutional right of suffrage,"—a proposition then by no means popular with the extreme Federalists of New England. A few weeks later he was appointed by a local mass convention of Federalists to write an address on the same subject, which became widely known as the 'Rockingham Memorial.' In it he set forth with signal force the complaints of his party; but as to the remedy, he consented to give voice to the sense

DANIEL WEBSTER.

WEBSTER

of the meeting by a thinly veiled threat of secession, and a hint at the possibility of a dissolution of the Union. In the first case he expressed his own opinions as a statesman and a patriot; in the second he accepted the opinions of those around him as his own, and spoke with equal ability and vigor as the mouthpiece or attorney of others: a double character, destined to reappear from time to time in his public life with puzzling effect.

New Hampshire sent him to Congress, where he took his seat in the House of Representatives in May 1813. He soon won a place in the front rank of debaters, especially on questions of finance. But the two terms during which he represented a New Hampshire constituency were a mere prelude to his great political career. In 1817 he left Congress to give himself to his legal practice, which gained much in distinction and lucrativeness by his removal to Boston. He rose rapidly to national eminence as a practitioner in the Federal as well as the State tribunals. It was there that he won peculiar lustre through his memorable argument in the famous Dartmouth College case before the Federal Supreme Court, which fascinated John Marshall on the bench, and moved to tears the thronged audience in the court-room. It left Webster with no superior and with few rivals at the American bar. It may be questioned whether he was a great lawyer in the highest sense. There were others whose knowledge was larger and more thorough, and whose legal opinion carried greater authority. But hardly any of these surpassed him in the faculty of seizing, with instinctive sureness of grasp, the vital point of a cause, of endowing mere statement with the power of demonstration, of marshaling facts and arguments in massive array for concentric attack on the decisive point, of moving the feelings together with the understanding by appeals of singular magic, and also of so assimilating and using the work of others as if it had been his own. Adding to all this the charm of that imposing personality, which made every word falling from his lips sound as if it were entitled to far more than ordinary respect, he could not fail to win brilliant successes. He was engaged in many of the most important and celebrated cases of his time—some then celebrated and still remembered because of the part he played in them.

In Boston, Webster found a thoroughly congenial home. Its history and traditions, its wealth and commercial activity, the high character of its citizenship, the academic atmosphere created by its institutions of learning, the refined tone of its social circles, the fame of its public men, made the Boston of that period, in the main attributes of civilized life, the foremost city in the United States. Boston society received Webster with open arms, and presently he became in an almost unexampled measure its idol. Together with the most distinguished personages of the State, he was elected a member of the convention called to revise the State Constitution, where as the champion of conservative principles he advocated and carried the proposition that the State Senate should remain the representative of property. When in 1820, the day arrived for the celebration of the two-hundredth anniversary of the landing of the Pilgrims on Plymouth Rock, it was he whom the public voice designated as the orator

of the day. The oration, with its historical picturesqueness, its richness of thought and reasoning, its broad sweep of contemplation, and the noble and magnificent simplicity of its eloquence, was in itself an event. No literary production of the period in America achieved greater renown. From that time on, Massachusetts loved to exhibit herself in his person on occasions of state; and in preference to all others, Webster was her spokesman when she commemorated the great events of her history. As such he produced a series of addresses—at the laying of the corner-stone, and later at the completion, of the Bunker Hill monument, on the death of John Adams and of Thomas Jefferson, and on other occasions—which his contemporaries acclaimed as ranking with the great oratorical achievements of antiquity.

Webster soon appeared in Congress again: first in 1823, in the House of Representatives, as the member from the Boston district; and a few years later in the Senate. Then began the most brilliant part of his political career. It was the period when the component elements of the old political parties—the Federalists and the Republicans—became intermingled; when old party issues vanished; and when new questions, or rather old questions in new shapes and relations, caused new groupings of men to be formed. In the confusion of the political and personal conflicts which characterized the so-called "era of good feeling," and which immediately followed it, Webster became a supporter of the administration of John Quincy Adams; and, as an old Federalist and conservative, was naturally attracted by that combination of political forces which subsequently organized itself as the Whig party.

In the House of Representatives he attracted the attention of the world abroad by a stinging philippic against the "Holy Alliance" in a eulogy on the Greek revolution, and by a sober exposition of the Monroe Doctrine in a speech on the famous Panama mission. But his most remarkable achievement was an argument against Henry Clay's "American System"—tariff protection as a policy, the very policy which was destined to become the corner-stone of the Whig platform. Webster's Free Trade speech—for so it may be called—summed up and amplified the views he had already expressed on previous occasions, in a presentation of fundamental principles so broad and clear, with a display of knowledge so rich and accurate, and an analysis of facts and theories so keen and thorough, that it stands unsurpassed in our political literature, and may still serve as a text-book to students of economic science. But Clay's tariff was adopted nevertheless; and four years later Webster abandoned many of his own conclusions, on the ground that in the meantime New England, accepting protection as the established policy of the country, had invested much capital in manufacturing enterprises, the success of which depended upon the maintenance of the protective policy, and should therefore not be left in the lurch. For this reason he became a protectionist. This plea appeared again and again in his high-tariff speeches which followed; but he never attempted to deny or shake the broad principles so strongly set forth in his great argument of 1824.

Webster reached the highest point of his power and fame when, in 1830, he gave

as a member of the Senate, voice as no one else could to the national consciousness of the American people. Before the War of 1812, the Union had been looked upon by many thoughtful and patriotic Americans as an experiment,—a promising one indeed, but of uncertain issue. Whether it would be able to endure the strain of divergent local interests, feelings, and aspirations, and whether its component parts would continue in the desire permanently to remain together in one political structure, were still matters of doubt and speculation. The results of the War of 1812 did much to inspire the American heart with a glow of pride in the great common country, with confident anticipations of its high destinies, and with an instinctive feeling that the greatness of the country and the splendors of its destinies depended altogether upon the permanency of the Union. The original theory that the Constitution of the United States was a mere compact of partnership between independent and sovereign commonwealths, to be dissolved at will, whatever historical foundation it might have had, yielding to an overruling sentiment of a common nationality. This sentiment was affronted by the Nullification movement in South Carolina, which, under the guise of resistance to the high tariff of 1828, sought to erect a bulwark for slavery through the enforcement of the doctrine that a State by its sovereign action could overrule a Federal law, and might, as a last resort, legally withdraw from the "federal compact." Against this assumption Webster rose up in his might, and in his famous "Reply to Hayne" struck down the doctrine of the legality of State resistance and of secession with blows so crushing, and maintained the supremacy of the Federal authority in its sphere, and the indissolubility of the Union, with an eloquence so grand and triumphant, that as his words went over the land the national heart bounded with joy and broke out in enthusiastic acclamations. At that moment Webster stood before the world as the first of living Americans. Nor was this the mere sensation of a day. His "Liberty and Union, now and forever, one and inseparable!" remained the watchword of American patriotism, and still reverberated 30 years later in the thunders of the Civil War. That glorious speech continues to hold the first place among the monuments of American oratory. In the contest against the Nullification movement in South Carolina, Webster firmly maintained, against Henry Clay's compromise policy, that wherever the national authority was lawlessly set at defiance, peace should never be purchased by concession to the challengers; and that it was time to "test the strength of the government." He therefore sturdily supported President Jackson's "Force Bill," although the administration of that doughty warrior was otherwise most uncongenial to him. But when the compromise had actually been adopted, he dropped back into the party line behind Clay's leadership, which he henceforth never again forsook. There was an element of indolence in his nature which it needed strong impulses to overcome, so as to set the vast machinery of his mind in full motion. Such an impulse was furnished again by Jackson's attack on the United States Bank, and by other somewhat autocratic financial measures. Webster opposed this policy in a series of

speeches on currency and banking, which deserve very high rank in the literature of that branch of economics. They were not free from partisan bias in the specific application of those fundamental principles of which Webster had such a masterly grasp; but notwithstanding this, his deep insight into the nature and conditions of credit, and his thorough study and profound judgment of the functions of banking, made him an invaluable teacher of the science of public finance. Nobody has ever depicted the vices and dangers inherent in an unsound currency, and the necessity of grounding the monetary system upon a firm basis of value, with greater force and more convincing lucidity.

But in spite of the brilliancy and strength of his efforts in opposing Jackson's wilful and erratic policies, Webster never became the real leader of the Whig party. Although greatly the superior of Clay in wealth of knowledge, in depth of thought, in statesmanlike breadth of view, in solidity of reasoning power, and in argumentative eloquence, he fell far behind him in those attributes which in contests for general leadership are apt to turn the scale. The spirit of initiative, force of will, that sincere self-confidence which extorts confidence from others, bold self-assertion in doubtful situations, and constant alertness in watching and directing the details of political movements. Clay therefore remained the general leader of the Whig party; while Webster, with New England at his back, stood now by his side, now behind him, as in feudal times a great duke, rich in treasure and lands and retainers, himself of royal blood, may have stood now behind, now by the side of his king. Unhappily for himself, Webster was not satisfied with the theatre of action on which his abilities fitted him for the greatest service, and on which he achieved his highest renown. At a comparatively early period of his career he ardently wished to be sent as minister to England, and he bore a grudge to John Quincy Adams for his failure to gratify that desire. Ever since his "Reply to Hayne" had made his name a household word in the country, an ungovernable longing possessed him to be President of the United States. The morbid craving commonly called "the Presidential fever" developed in him, as it became chronic, its most distressing form, disordering his ambition, unsettling his judgment, and warping his statesmanship. His imagination always saw the coveted prize within his grasp, which in reality it never was. He lacked the sort of popularity which since the administration of John Quincy Adams seemed to be required for a Presidential candidacy. People listened to him with rapture and wonder, but as to the Presidency, the fancy and favor of the politicians, as well as of the masses, obstinately ran to other men. So it was again and again. Clay, too, was unfortunate as a Presidential candidate; but he could obtain at least the nomination of his party so long as there appeared to be any hope for his election. Webster was denied even that. The vote for him in the party conventions was always distressingly small—usually confined to New England, or only a part of it. Yet he never ceased to hope against hope, and thus to invite more and more galling disappointments. To Henry Clay he could yield without humiliation; but when he saw his party prefer to himself not

once, but twice and three times, men of only military fame, without any political significance whatever, his mortification was so keen that in the bitterness of his soul he twice openly protested against the result.

The cause of this steady succession of failures may have been, partly, that the people found him too unlike themselves, too unfamiliar to the popular heart; and partly that the party managers shrunk from nominating him because they saw in him not only a giant, but a very vulnerable giant, who would not "wear well" as a candidate. They had indeed reason to fear the discussions to which in an excited canvass his private character would be subjected. Of his moral failings, those relating to money were the most notorious and the most offensive to the moral sense of the plain people. In the course of his public life he became accustomed not only to the adulation but also to the material generosity of his followers. Great as his professional income was, his prodigality went far beyond his means; and the recklessness with which he borrowed and forgot to return, betrayed an utter insensibility to pecuniary obligation. With the coolest nonchalance he spent the money of his friends, and left to them his debts for payment. This habit increased as he grew older, and severely tested the endurance of his admirers. So grave a departure from the principles of common honesty could not fail to cast a dark shadow upon his character, and it is not strange that the cloud of distrust should have spread from his private to his public morals. The charge was made that he stood in the Senate advocating high tariffs as the paid attorney of the manufacturers of New England. It was met by the answer that so great a man would not sell himself. This should have been enough. Nevertheless, his defenders were grievously embarrassed when the fact was pointed out that it was after all in great part the money of the rich manufacturers and bankers that stocked his farm, furnished his house, supplied his table, and paid his bills. A man less great could hardly have long sustained himself in public life under such a burden of suspicion. That Daniel Webster did sustain himself, strikingly proved the strength of his prestige. But his moral failings cost him the noblest fruit of great service,—an unbounded public confidence. Although disappointed in his own expectations, he vigorously supported General Harrison for the Presidency in the campaign of 1840, and in 1841 was made secretary of state. He remained in that office until he had concluded the famous Ashburton Treaty, under the administration of President Tyler, who turned against the Whig policies. After his resignation he was again elected to the Senate. Then a fateful crisis in his career approached.

The annexation of Texas, the Mexican war, and the acquisition of territory on our southern and western borders, brought the slavery question sharply into the foreground. Webster had always, when occasion called for a demonstration of sentiment, denounced slavery as a great moral and political evil, and although affirming that under the Constitution it could not be touched by the action of the general government in the States in which it existed, declared himself against its extension. He had opposed the annexation of Texas, the war against Mexico, and the enlargement of the republic by

conquest. But while he did not abandon his position concerning slavery, his tone in maintaining it grew gradually milder. The impression gained ground that as a standing candidate for the Presidency, he became more and more anxious to conciliate Southern opinion. Then the day came that tried men's souls. The slave power had favored war and conquest, hoping that the newly acquired territory would furnish more slave States and more Senators in its interest. That hope was dashed when California presented herself for admission into the Union, with a State constitution excluding slavery from her soil. To the slave power this was a stunning blow. It had fought for more slave States and conquered for more free States. The admission of California would hopelessly destroy the balance of power between freedom and slavery in the Senate. The country soon was ablaze with excitement. In the North the antislavery feeling ran high. The "fire-eaters" of the South, exasperated beyond measure by their disappointment, vociferously threatened to disrupt the Union. Henry Clay, true to his record, hoped to avert the danger by a compromise. He sought to reconcile the South to the inevitable admission of California by certain concessions to slavery, among them the ill-famed and ill-fated Fugitive Slave Law; a law offensive not only to antislavery sentiment, but also to the common impulses of humanity and to the pride of manhood.

Webster had to choose. The antislavery men of New England, and even many of his conservative friends, hoped and expected that he would again, as he had done in Nullification times, proudly plant the Union flag in the face of a disunion threat, with a defiant refusal of concession to a rebellious spirit, and give voice to the moral sense of the North. But Webster chose otherwise. On the 7th of March 1850, he spoke in the Senate. The whole country listened with bated breath. While denouncing secession and pleading for the Union in glowing periods, he spoke of slavery in regretful but almost apologetic accents, upbraided the abolitionists as mischievous marplots, earnestly advocated the compromise, and commended that feature of it which was most odious to Northern sentiment,—the Fugitive Slave Law. From this "Seventh of March Speech"—by that name it has passed into history—Webster never recovered. It stood in too striking a contrast to the "Reply to Hayne." There was indeed still the same lucid comprehensiveness of statement. The heavy battalions of argument marched with the same massive tread. But there was lacking that which had been the great inspiration of the "Reply to Hayne,"—the triumphant consciousness of being right. The effect of the speech corresponded to its character. Southern men welcomed it as a sign of Northern submissiveness, but it did not go far enough to satisfy them. The impression it made upon the antislavery people of the North was painful in the extreme. They saw in it "the fall of an archangel." Many of them denounced it as the treacherous bid of a Presidential candidate for Southern favor. Their reproaches varied from the indignant murmur to the shrillest note of execration. Even many of his staunchest adherents among the conservative Whigs stood at first stunned and perplexed, needing some time to gather themselves up for his defense. This was not surprising. Henry

Clay would plan and advocate the compromise of 1850 without loss of character. Although a man of antislavery instincts, he was himself a slaveholder representing a slaveholding community, a compromiser in his very being; and compromise had always been the vital feature of his statesmanship. But Webster could not apologize for slavery, and in its behalf approve compromise and concession in the face of disunion threats, without turning his back upon the most illustrious feat of his public life. Injustice may have been done to him by the assailants of his motives, but it can hardly be denied that the evidence of circumstances stood glaringly against him. He himself was ill at ease. The virulent epithets and sneers with which he thenceforth aspersed antislavery principles and antislavery men—contrasting strangely with the stately decorum he had always cultivated in his public utterances—betrayed the bitterness of a troubled soul.

The 7th of March speech, and the series of addresses with which he sought to set right and fortify the position he had taken, helped greatly in inducing both political parties to accept the compromise of 1850, and also in checking, at least for the time being, the antislavery movement in the Northern States. But they could not kill that movement, nor could they prevent the coming of the final crisis. They did, however, render him acceptable to the slave power, when, after the death of General Taylor, President Fillmore made him secretary of state. In 1852 his hope to attain the Whig nomination for the Presidency rose to the highest pitch, although his prospects were darker than ever. But he had reached the age of seventy; this was his last chance, and he clung to it with desperate eagerness. He firmly counted upon receiving in the convention a large number of Southern votes; he received not one. His defeat could hardly have been more overwhelming. The nomination fell to General Scott. In the agony of his disappointment, Webster advised his friends to vote for the Democratic candidate, Franklin Pierce. In 1848 he had declared General Taylor's nomination to be one "not fit to be made"; but after all he had supported it. Then he still saw a possibility for himself ahead. In 1852, the last hope having vanished, he punished his party for having refused him what he thought his due, by openly declaring for the opposition. The reasons he gave for this extreme step were neither tenable, nor even plausible. It was a wail of utter despair. His health had for some time been failing, and the shock which his defeat gave him aggravated his ailment. On the morning of 24 Oct. 1852 he died.

Over Webster's grave there was much heated dispute as to the place he would occupy in the history of his country. Many of those who had idolized him during his life extolled him still more after his death, as the demigod whose greatness put all his motives and acts above criticism, and whose genius excused all human frailties. Others, still feeling the smart of the disappointment which that fatal 7th of March had given them, would see in him nothing but rare gifts and great opportunities prostituted by vulgar appetites and a selfish ambition. The present generation, remote from the struggles and passions of those days, will be more impartial in its judgment. Looking back upon the

time in which he lived, it beholds his statuesque form towering with strange grandeur among his contemporaries,—huge in his strength, and huge also in his weaknesses and faults; not indeed an originator of policies or measures, but a marvelous expounder of principles, laws, and facts, who illumined every topic of public concern he touched, with the light of a sovereign intelligence and vast knowledge; who, by overpowering argument, riveted around the Union unbreakable bonds of constitutional doctrine; who awakened to new life and animated with invincible vigor the national spirit; who left to his countrymen and to the world invaluable lessons of statesmanship, right, and patriotism, in language of grand simplicity and prodigiously forceful clearness; and who might stand as its greatest man in the political history of America, had he been a master character as he was a master mind.

Consult: Curtis, 'Life of Daniel Webster' (1870); Wilkinson, 'Webster: an Ode' (1882); Lodge, 'Daniel Webster' in 'American Statesman Series' (1883); McMaster, 'Daniel Webster' (1902); and the histories of Schouler, Rhodes, and Von Holst. Webster's private correspondence was published in 1857, and his speeches, etc., in six volumes.

CARL SCHURZ,
Author of 'Life of Henry Clay.'

Webster, Ebenezer, American patriot, father of Daniel Webster (q.v.): b. Kingston, N. H., 1739; d. Franklin, N. H., 1806. In his youth he served under Gen. Amherst in the "old French war," and in 1761 was one of the original settlers of that part of the town of Salisbury now known as Franklin. He united, as was common at the time, the occupations of farmer and innkeeper, took an active part in public matters, and at the outbreak of the Revolution led the Salisbury militia to Cambridge. Subsequently he fought at White Plains and Bennington, and served in other campaigns until the close of the war, when he had attained the rank of colonel of militia. He was at various times a member of both branches of the legislature, and in 1791 was appointed judge of the court of common pleas, which office he held till his death. In personal appearance he resembled his son Daniel, being of a large frame, with a swarthy complexion and dark piercing eyes.

Webster, Henry Kitchell, American author: b. Evanston, Ill., 7 Sept. 1875. He was graduated from Hamilton College, Clinton, N. Y., in 1897, and in the following year was instructor in rhetoric at Union College. With Samuel Merwin (q.v.), he has written: 'The Short Line War' (1899); and 'Calumet "K"' (1901). His own work includes: 'The Banker and the Bear' (1900); 'Rogers Drake, Captain of Industry' (1903); etc.

Webster, Herbert Tracy, American eclectic physician and author: b. Portland Township, Chautauqua County, N. Y., 14 Oct. 1847. He was graduated at the Eclectic Medical Institute of Cincinnati in 1869, and in 1882 was appointed professor of materia medica in the California Medical College (now located at San Francisco), and now fills the chair of principles and practice of medicine in the same institution. He has written 'Principles of Medicine'; 'Dynamical Therapeutics,' and 'The New Eclectic Practice of Medicine.'

Webster, John, English dramatist: b. about 1580; d. about 1625. He appears to have followed the occupation of his father, a tailor, and in 1604 was a freeman of the Merchant Taylors' Company. In 1602 he began to write plays in collaboration with other playwrights, but attained to his full power only when, between 1607 and 1612, he adopted independent authorship. He added to 'The Malcontent,' a play by John Marston, and was associated with Dekker in writing the two vigorous prose comedies, 'Westward Ho' (acted 1604), and 'Northward Ho' (acted 1605). 'The White Devil,' or 'Vittoria Corombona,' a tragedy published in 1612, was his first independent work, and is now recognized as one of the best tragedies of its age. 'Appius and Virginia,' published in 1614, followed soon afterward, and in 1616 his masterpiece, 'The Duchess of Malfi,' was first produced at the Blackfriars Theatre. It was first published in 1623. This great tragedy, which has won enthusiastic praise from Charles Lamb and many subsequent critics of eminence, is based on a Neapolitan story found in Bandello. 'The Devil's Law Case' was published in 1623, and appears to have been Webster's last play. Of other plays sometimes ascribed in part to Webster, only 'A Cure for a Cuckold' (published 1661) seems to contain any of his work. Webster wrote in 1624 a pageant for the Lord Mayor of London, and in 1612 was associated with Heywood and Tournear in producing 'Three Elegies to the Memory of Prince Henry.' He also contributed verses to other works. There are editions of Webster's works by Dyce (1830; new eds. 1857 and 1886) and Hazlitt (1856). J. A. Symonds edited a selection in the 'Mermaid Series' in 1888, and there is an edition of 'The Duchess of Malfi' in the 'Temple Dramatists' by C. E. Vaughan (1896). Consult: Hazlitt, 'Dramatic Literature of the Age of Elizabeth' (ed. 1840); Vopel, 'John Webster: Researches on his Life and Plays' (1887); Gosse, '17th Century Studies' (1883); Swinburne, 'Studies in Prose and Poetry' (1894). Lamb was the earliest among 19th century critics to give due praise to Webster, and Swinburne enthusiastically places him next to Shakespeare among English dramatists.

Webster, Julia Augusta Davies, English poet and dramatist: b. Poole, Dorsetshire, 30 Jan. 1837; d. Kew, Surrey, 5 Sept. 1894. She was a daughter of Admiral George Davies, and was married to Thomas Webster, a fellow of Trinity College, in 1863. In 1879 she was elected to the London School Board. Her first work was published under a pseudonym, which she soon discarded, and her early inclinations led her to make translations from the Greek in which field she did admirable work. As a dramatic poet she takes high rank, but her verse appeals most nearly to highly cultured readers. Her works include: 'Dramatic Studies' (1866); 'Portraits' (1870); the dramas 'Disguises' (1879); 'In a Day' (1882) and 'The Sentence' (1887); 'The Medea of Euripides,' translation (1868); 'A Housewife's Opinions' (1878); 'Daffodil and the Croaxaxicans' (1884); etc.

Webster, Noah, American lexicographer: b. Hartford, Conn., 16 Oct. 1758; d. New Haven, Conn., 28 May 1843. In 1774 he entered Yale College, but his studies were interrupted by the outbreak of the Revolutionary War, in which

he served under his father as a volunteer. He was graduated in 1778, and was admitted to practise law in 1781, but the unsettled state of the country prevented his obtaining a suitable opening in his profession, and in 1782 he removed to Goshen, N. Y., where he taught a classical school. Soon after he published his 'Grammatical Institute of the English Language,' in three parts, Part 1 (1783) containing 'A New and Accurate Standard of Pronunciation'; Part 2 (1784), 'A Plain and Comprehensive Grammar'; Part 3 (1785) 'An American Selection of Lessons in Reading and Speaking.' The first part of this work afterward became popularly known as 'Webster's Spelling-book.' In 1889 it was stated that 62,000,000 copies of the work had then been published. His literary activity was henceforth very great, and among works issued by him during the next few years are 'Sketches of American Policy' (1784-5), an argument for the formation of a national constitution. In 1787, after the adjournment of the Constitutional convention, he published the pamphlet, 'Examination of the Leading Principles of the Federal Constitution'; and 'Dissertations on the English Language' (1789). He began the practice of law at Hartford in 1789, but removed in 1793 to New York, where he established a daily paper, the *Miner* (later *The Commercial Advertiser*), for the purpose of supporting the government. He published in 1794 a pamphlet on the 'Revolution in France,' and wrote ten essays under the signature of 'Curtius,' in favor of the Jay treaty with Great Britain. These publications had a powerful influence in stemming the tide of feeling in favor of a French alliance. In connection with the visitation of yellow fever he made a special study of the history of pestilential diseases, and wrote a work on contagious diseases which was published in England and America in 1799. In the previous year he had removed to New Haven. In 1802 he published 'Historical Notices of the Origin and State of Banking Institutions and Insurance Offices.' His great work was the 'American Dictionary of the English Language.' He devoted many years to the collection of new words and preparation of more free and exact definitions. In 1824, when the book was nearly finished, he visited Europe to procure such information as he had been unable to obtain in America. After a short stay in Paris he went to England, where he finished his dictionary during an eight months' residence in Cambridge. In June 1825, he returned to America. An edition of 2,500 copies of his dictionary was published in 1828, followed by an edition of 3,000 in England under the superintendence of E. H. Barker. The work contained 12,000 words and 40,000 definitions not to be found in any similar publication. In 1840-1 he published a second edition in two volumes, with extensive additions to the vocabulary and corrections of definitions. His 'Collection of Papers on Political, Literary and Moral Subjects' was a reprint of some of his earlier writings. Webster was throughout life associated with many of the most eminent men of the country, and always took an active share in public life, supporting his party chiefly by his pen. Several enlarged and improved editions of his dictionary have been published since his death both in America and in England, and it has always held its place as a standard work.

Among his further writings are: 'Letters to Dr. Priestly' (1800); 'Origin, History and the Connection of the Languages of Western Asia and of Europe' (1807); and a 'History of the United States' (rev. ed. 1838). Consult the 'Life' by Scudder (1882) in the 'American Men of Letters' series.

Webster, Sir Richard Everard, 1st Baron ALVERSTONE, English jurist: b. 22 Dec. 1842. He was educated at Cambridge, was called to the bar in 1868, became queen's counsel in 1878 and was attorney-general in Lord Salisbury's cabinet in 1885-6, 1886-92, and 1895-1900. He was returned to Parliament for Launceston in 1885, and in 1885-1900 was member for the Isle of Wight. He was knighted in 1885, created a baronet in 1900 and in that year was raised to the peerage. In 1893 he was one of the British representatives before the Bering Sea Arbitration Tribunal. He was Master of the Rolls, May-October 1900, and was then appointed chief justice. He served as a member of the Alaskan Boundary Tribunal in 1903.

Webster, Mass., town in Worcester County; on the French River, and on the New York, N. H. & H., and the Boston & A. R.R.'s; 15 miles south of Worcester. It is in an agricultural region and has considerable industrial interests connected with farm products. A lake (1,225 acres) is one of the attractions of the town. It has cotton and woolen mills, shoe factory, and machine shops. It has a good water system. There are 11 churches, a high school, 13 graded public schools, three graded parish schools, and a public library. There is one national and one savings bank. The savings bank has deposits amounting to about \$2,000,000. The government is administered by annual town meetings. Webster was set off from Dudley and Oxford and in 1832 was incorporated. Pop. (1910) 11,509.

Webster-Ashburton Treaty, The, in American history, a treaty between the United States and Great Britain, negotiated by Daniel Webster and Lord Alexander Baring Ashburton in August 1842. By this treaty the frontier line between the State of Maine and Canada was definitely agreed to. By this agreement seven twelfths of the disputed ground, and the British settlement of Madawaska, were given to the United States, and only five twelfths of the ground to Great Britain; but it secured a better military frontier to England, and included heights commanding the Saint Lawrence, which the award of the king of Holland, who had been chosen arbiter, had assigned to the Americans. By the 8th and 9th articles, provisions are made for putting an end to the African slave-trade; and the 10th article provides for the mutual extradition of suspected criminals. See TREATIES; UNITED STATES—ARBITRATION IN THE.

Webster City, Iowa, county-seat of Hamilton County; on the Boone River, and on the Webster City & S., the Chicago & N., and the Illinois C. R.R.'s; about 70 miles north of Des Moines. It is in an agricultural region, in which there are a number of coal mines. It has a shoe factory, foundry, machine shops, iron furnaces, flour mill, grain elevators, and large coal yards. It has a high school, graded public and parish schools. The four banks have a com-

bined capital of \$275,000 and deposits (1903) amounting to \$1,210,000. Pop. (1880) 1,248; (1890) 2,829; (1900) 4,613; (1910) 5,208.

Webworms, a name applied to various species of caterpillars or lepidopterous larvæ because of their habit of spinning webs of silk enclosing leaves upon which they feed and also serving as a shelter. As a rule neither the web-spinning nor the social habit is so highly developed as in the tent-caterpillars (q.v.), but there is no sharp distinction in the application of the two names. The species of caterpillars exhibiting such habits are quite numerous and belong to a number of genera and families of moths (q.v.). Some of them are of considerable economic importance. The fall webworm is the larva of the small white moth (*Hyphantria cunea*). As soon as they leave the egg all of the larvæ hatching from a mass spin a common web enclosing several leaves. After these are eaten the caterpillars wander farther and farther in search of food, sometimes destroying the entire foliage of a tree, but always return to the shelter of the nest to rest when not feeding. The web may be extended to include whole branches. The caterpillars are covered with long hairs, and there are two broods, one in the spring and one in the fall, the latter being unusual among species of similar habit, wherefore the name. All kinds of shade and ornamental trees suffer from their attacks. As typical of a large and quite distinct group of caterpillars is the garden webworm (*Loxostege similalis*). This is a small, nearly naked caterpillar, which feeds in company on all kinds of garden vegetables, the leaves of which are drawn together in small webs. Some of the related species form large colonies and one small form is often very destructive to dried clover hay. The root webworms are the caterpillars of the little roll-wing moths. *Crambus vulvivagellus* is a common species which spins a web about the stalks and roots of grass to which, as well as to corn, it is sometimes very destructive. The true tent-caterpillars (q.v.) belong to the genus *Clisiocampa* and family *Bombycidae* or silk-spinning moths. A quite unrelated species is *Catania cerasivorana*, which forms veritable silken tents, sometimes covering small trees entirely. The general method of combating webworms is to destroy their eggs in winter, to burn the newly-formed tents, and to spray the foliage about the tents with arsenical solutions. The ground-webs may be checked by fall plowing.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); and publications of the U. S. Department of Agriculture.

Wedderburn, wêd'ér-bérn, Alexander, BARON LOUGHBOROUGH and 1st EARL OF ROSSLYN, British politician: b. Edinburgh 13 Feb. 1733; d. near Windsor, England, 2 Jan. 1803. He was educated at the University of Edinburgh, was called to the English bar in 1757, entered Parliament in 1761 as member for Ayr, and subsequently represented various constituencies. He pleaded the great Douglas case in 1768-89, and in 1771 left the ranks of the opposition to become a firm supporter of Lord North, who had appointed him solicitor-general. He strenuously opposed the claims of the American colonists, defending the policy of Lord North throughout

WEDDERBURN — WEDGWOOD WARE

the American war. He was made chief justice of the court of common pleas in 1780, at the same time being raised to the peerage as Baron Loughborough, and in 1783 assisted in forming the coalition ministry, but in 1784 he joined the forces of Fox. He subsequently made friends with Pitt and gained from him the place of lord chancellor, after which he joined the supporters of George III. Upon his retirement from the chancellorship in 1801 he was created Earl of Rosslyn.

Wedderburn, James, Scottish psalmist: b. Dundee, Scotland, about 1500; d. England, about 1564. He studied at the University of Saint Andrew, became interested in the Scottish Reformation, and fled to France to escape prosecution as a heretic. He edited, with his brothers Robert and John, the principal song book used in Scotland, 'Ane Compendius Buike of Godly and Spirituall Songs, Collectit Out of Sundrie Partes of the Scripture, wyth Sundrie of Uther Ballates Changed Out of Prophane Songs, for Avoyding of Sinne and Harlotrie' (about 1548). Later editions of this work have been edited by David Laing (1868) and Mitchell (1897). He is also credited with the authorship of 'The Complaynt of Scotland' (1548), 'the only classic work in old Scottish prose.' Consult Mitchell, 'The Wedderburns and Their Work' (1898).

Wedding Anniversaries, or celebrations held as follows: The Cotton wedding, 1 year; the Paper wedding, 2 years; the Leather wedding, 3 years; the Wooden wedding, 5 years; the Woolen wedding, 7 years; the Tin wedding, 10 years; the Silk and Fine Linen wedding, 12 years; the Crystal (Glass) wedding, 15 years; the China wedding, 20 years; the Silver wedding, 25 years; the Golden wedding, 50 years; the Diamond wedding, 75 years.

Wedding Ceremonies. See MARRIAGE.

Wedge, a piece of wood or metal, thick at one end and sloping to a thin edge at the other, used in splitting wood, rocks, etc. The wedge is one of the mechanical powers, and besides being used for splitting purposes, is used for producing great pressure, as in the oil-press, and for raising immense weights, as when a ship is raised by wedges driven under the keel. If the power applied to the top were of the nature of a continued pressure, the wedge might be regarded as a double inclined plane, and the power would be to the resistance to be overcome as the breadth of the back to the length of the side, on the supposition that the resistance acts perpendicularly to the side. But since the power is usually that of percussion with a hammer, every stroke of which causes a tremor in the wedge, which throws off for the instant the resistance on its sides, no certain theory can be laid down regarding it. To calculate the power we require the additional elements of weight of the hammer, momentum of the blow, and the intervals between the blows, and further the amount of tremor in the wedge and its antagonism to the resistance on the sides. All that is known with certainty respecting the theory of the wedge is that its mechanical power is increased by diminishing the angle of penetration.

Wedgwood, wĕj'wud, Josiah, English potter: b. Burslem, Staffordshire, 12 July 1730; d. Etruria, Staffordshire, 3 Jan. 1795. He was the

son of a potter in the district and on the death of his father was employed in the pottery at nine. An incurable lameness later compelled him to give up the wheel and he removed for a time to Stoke, where he entered into partnership with other potters and where his talent for ornamental pottery was first displayed. In 1759 he returned to Burslem, and set up a small manufactory of his own, in which he made white stoneware, and the cream-colored ware for which he became so famous. He presently succeeded in producing a ware so hard and durable as to render works of art produced in it almost indestructible, and also in executing paintings on pottery without the artificial gloss so detrimental to the effect of superior work. In 1771 he erected potteries at Etruria, a village which he founded for his workmen. His improvements in pottery, which included form, substance, and decoration, in all of which he attained an excellence rarely equaled, created the great trade of the Staffordshire potteries, which even during his lifetime acquired a remarkable expansion. He made 50 copies of the Portland vase, which were sold for 50 guineas each, a sum which it is said did not cover his expenditure in their production. (See POTTERY; WEDGWOOD WARE.) Consult: Jewett, 'The Wedgwoods' (1865); Eliza Meteyard, 'Life' (1860); Rathbone, 'The Masterpieces of Old Wedgwood Ware' (1892-3); 'Life,' by Smiles (1894).

Wedgwood Pyrometer, in physics, a pyrometer in which temperature is ascertained by the contraction of baked clay, measured before and after its subjection to the action of heat.

Wedgwood Ware, a variety of English pottery first made by Josiah Wedgwood (q.v.), in which artistic designs and treatment were combined with mechanical and technical excellence. There were six distinguishing kinds of this ware, arranged in the order of their invention as follows: (1) Cream-colored ware, called Queen's ware, in various hues of cream color, saffron, and straw. (2) Egyptian black, or basaltic ware, used for seals, plaques, life-size busts, medallion portraits, etc. (3) Red ware, or Russo antico. (4) White semi-porcelain, or fine stoneware, differing from the white jasper in its pale straw-colored or grayish hue, and in its waxlike smooth surface and sub-translucency. (5) Variegated ware, of two kinds, one a cream-colored body, marbled, mottled, or spangled with divers colors upon the surface and under the glaze; the other an improved kind of agate ware, in which the colored clays in bands, twists, stripes, and waves constituted the entire substance. (6) Jasper ware, in which the chief triumphs of Wedgwood were wrought, resembling outwardly the finest of his white terra-cotta and semi-porcelain bodies. One of his earliest recipes for this last-named ware was, in percentage, barytes, 57.1; clay, 28.6; flint, 9.5; barium carbonate, 4.8; the novelty of these components being the use of the barytes and barium carbonate. A very little cobalt was occasionally added, even to the white jasper ware, to neutralize the yellowish hue, and by introducing a little Cornish stone or other felspathic material it became less opaque and more wax-like.

There are seven colors in Wedgwood ware besides the white—blue of various shades, lilac,

pink, sage-green, olive-green, yellow, and black—and it is remarkable for the absence of bubbles and holes, the flatness of the field, and the uniformity of grain. It was produced in numberless forms—cameos, intaglios, portrait medallions, statuettes, vases, etc., and the yellow variety is rare. Wedgwood's artistic work consists not only in copies of antique gems and in the adaptation of antique designs, but in the original productions of many English and foreign draughtsmen and modelers.

Wedmore, Frederick, English author: b. Richmond Hill, Clifton, England, 9 July 1844. He was educated in France, has been art critic on the London *'Standard'* since 1878, and has published an edition of Michel's *'Rembrandt'*; *'Poems of the Love and Pride of England'* with his daughter Millicent. Among works of his own are: *'Pastorals of France'* (1877); *'Life of Balzac'* (1890); *'Studies in English Art'* (1876; 1880); *'On Books and Art'* (1899); *'The Collapse of the Penitents'*, a novel; *'Turner and Ruskin'* (1900); etc.

Wednesbury, wēnz'bū-rī, England, a manufacturing town in Staffordshire, 19 miles south-southeast of Stafford. The Gothic parish church stands on the summit of a hill at the northern extremity of the town; there are several other churches and chapels, a town hall, free library, a mechanics' institute, public baths, a benevolent society, an alms-house, and several schools. The principal manufactures are railway carriages, patent axles, and general ironwork for railways; steel tubing for gas and water, and steam pipes; gun locks and barrels, springs for coaches, hinges, nails, screws, spades, shovels, edge tools, and wrought iron work of every description. Pop about 29,000.

Wednesday, the fourth day of the week. The Germans call it *Mittwoch* (mid-week). The English name is derived from the old Scandinavian deity Odin or Woden. In Anglo-Saxon it is *Wodnesdag*; in Swedish, *Odensdag*; in Dutch, *Woensdag*. See also **ASH-WEDNESDAY**.

Weed, Clarence Moores, American zoologist: b. Toledo, Ohio, 1864. He was graduated from the Michigan Agricultural College in 1883 and is at present (1904) professor of zoology at New Hampshire College. He has written: *'Insects and Insecticides'* (1893); *'Ten New England Blossoms and Their Insect Visitors'* (1895); *'Seed Travelers'* (1898); *'Insect World'* (1899); *'The Flower Beautiful'* (1903); *'The Nature Calendar Series'* (1900-3); etc.

Weed, Edwin Gardner, American Protestant Episcopal bishop: b. Savannah, Ga., 23 July 1837. He was educated at the University of Georgia and studied theology at the General Theological Seminary whence he was graduated in 1870. He took priest's orders in the Episcopal Church in 1871 and was rector of the Church of the Good Shepherd, Summerville, Ga., 1871-86. In the year last named he was consecrated bishop of Florida.

Weed, Stephen Hinsdale, American soldier: b. New York 1834; d. near Gettysburg, Pa., 2 July 1863. He was graduated from West Point in 1854, served on the Texan frontier and in the Florida wars of 1855-7, receiving rank as lieutenant in 1856, and in 1858-61 he was on

duty in Kansas and Utah. In 1861 he was promoted captain and assigned to the command of a battery in the Army of the Potomac. He was engaged in the Maryland, Peninsular and Northern Virginia campaigns, and fought at Manassas, Antietam, and Chancellorsville, receiving promotion to brigadier-general of volunteers for gallantry at the latter. He commanded a brigade of artillery at Gettysburg 2 July 1862, and was killed while holding Little Round Top against the terrific onslaught of the Confederates. The place where he fell is now called *'Weed's Hill.'*

Weed, Thurlow, American journalist and political leader: b. Cairo, Greene County, N. Y., 15 Nov. 1797; d. New York 22 Nov. 1882. He entered a printing office at 14, but left his trade for a time to serve in the army during the War of 1812; in 1815-19 he worked as a printer in New York; and in 1819 went to central New York State, where he established and edited successively *'The Agriculturist'* at Norwich, and the *'Onondaga County Republican'* at Manlius. In 1822 he became editor of the *Rochester Telegraph*, a daily paper, and later its proprietor. During the Anti-Masonic excitement he stopped the publication of the *Telegraph*, and issued the *Anti-Masonic Enquirer*. He was twice elected to the State Legislature on the Anti-Masonic ticket, and while in Albany became noted as a shrewd political manager. In 1830 he moved to Albany and established the *Albany Evening Journal*, which he edited till 1865. This paper was first used as a means of attacking the Albany *'Regency,'* a body of politicians under the leadership of Martin Van Buren, and it soon became the leading journal of the Whig party in the State. Through the influence of this paper and his political skill, Weed became the dominant State manager of the Whig, and later of the Republican, party. He held no public office himself, but for many years practically controlled the nominations for State officers; his control being used as a rule for the public good; some of the most efficient governors of the State were elected under his management. He also took a leading part in national politics as early as 1824, and when J. Q. Adams was nominated for the presidency was instrumental in uniting the Clay and Adams factions; was particularly influential in securing the nomination of Harrison in 1840, Clay in 1844, and Taylor in 1848; and materially aided in the nomination of Scott in 1852 and Frémont in 1856. In 1860 his first choice for the presidency was Seward, but he loyally supported Lincoln after his nomination, and urged his renomination in 1864. Weed had long been a personal friend of Seward, and was for some time closely associated with Seward and Greeley in what was known as *'the political firm of Seward, Weed and Greeley.'* In 1861 he went to Europe on a diplomatic mission to place the North in a favorable light before foreign governments, and to prevent their intervention in behalf of the South. After 1865 he was for a time a member of the editorial staff of the *New York Times*; in 1867-8 was editor of the *Commercial Advertiser* in New York. His health then forced him to resign continuous journalistic work, but he continued to write occasionally for newspapers and periodicals, and though he took no active part in politics, his advice was sought by Republican leaders, and

WEED--WEEK

had no small influence in shaping the policy of the party. He published 'Letters from Europe and the West Indies' (1866); and prepared his 'Autobiography,' which was published after his death (1884). Consult: Barnes, 'Mémorial of Thurlow Weed' (1884).

Weed, Walter Harvey, American geologist: b. Saint Louis, Mo., 1 May 1862. He was graduated from the Columbia School of Mines in 1883, and in that year was appointed to the United States Geological Survey. In 1883-9 he was engaged in Yellowstone Park, where his investigations proved that the colors in hot springs and deposits in geysers are due to algae, and he also discovered Death Gulch in that park. He was occupied in a general geological exploration of Montana in 1889-98, and in 1899 published his theory of secondary enrichments of ore deposits. He was appointed commissioner and expert on copper at the Louisiana Purchase Exposition in 1904. His publications include: 'Glaciation of Yellowstone Park' (1893); 'Secondary Enrichment of Mineral Veins' (1899); etc.

Weed'en, William Babcock, American manufacturer and economic and historical writer: b. Bristol, R. I., 1 Sept. 1834. He studied at Brown University, and then engaged in the manufacture of woolen goods in Providence. In 1861 he joined the Union army as 1st lieutenant of artillery; was promoted captain after the first battle of Bull Run; was present during the siege of Yorktown, and took part in the engagements at Hanover Court House, Mechanicsville, Gaines' Mill, and Malvern Hill. In August 1862 he resigned and resumed business in Providence. His publications include: 'Morality of Prohibitory Liquor Laws' (1875); 'Social Law of Labor' (1882); 'Economic and Social History of New England, 1620-1789' (1890).

Weeds are plants growing where they are not desired. There are no plants which are weeds, *per se*, since in nature each plant has its place, and since in cultivated areas any plant, useless or useful, may become a weed. Thus grass would be considered a weed in a bed of garlic, and *vice versa*. Many plants, however, are popularly dubbed weeds because they are troublesome in fields and gardens, but even among these are not a few which are cultivated; for instance, purslane, lamb's quarters, and sorrel. Far from being the useless and obnoxious things that they have long been reputed to be, weeds have performed a distinct service, which they still continue, in agriculture; they have compelled the husbandman to practise clean cultivation, upon which the success of his crops very largely depends.

Weeds often must be eradicated upon land that has become foul under neglect. Upon pastures and lawns that commence to fail the two principal ways of management are to make more grass grow or to plow the land and grow some other crop upon it for a year or more. The former is usually more feasible with lawns; the latter with meadows and pastures. Often a re-seeding to grass will be sufficient. The plantain, dandelion, and similar weeds troublesome in lawns may be cut out individually, but to keep them out the growth of grass must be encouraged by sowing extra seed and by fertilizing. In

land that has lain fallow the annual weeds may be destroyed by frequent cultivation; biennial and perennial weeds, by short rotations of crops, especially such as include intertillage crops, like potatoes, beans, and turnips. The one necessity to observe in combating perennial weeds is to prevent their forming leaves and thus elaborating food. In low grounds where sedges, rushes, and bracken often abound, the land may be rid of these weeds by draining. In gardens many weeds may be "smothered" by growing leafy crops which will shade the ground. Ground which is kept free from weeds in the early months may become choked with weeds toward autumn and these may re-seed the ground for the following year. Mowing before the plants blossom, or plowing the ground are often practised. In some cases, however, the plants may be allowed to remain as a cover crop to prevent the washing of the soil during winter. This practice is most common in orchards. A cover crop sown by the orchardist is preferable.

Beside the usual means of seed dispersal, such as wind and water, weeds are frequently distributed by means of baled hay, manure, and imperfectly cleaned seeds of the crops sown. This last is particularly prevalent with such difficultly cleaned seeds as grass and clover. Hence the advisability of purchasing only the best seeds. It is not remarkable that many of the most troublesome weeds are imported from foreign countries, because being removed from their natural controls they find less resistance and spread accordingly.

Weeds are often of service in aiding the farmer to judge the needs of his land, since many kinds grow only where the conditions are peculiarly adapted to them. The character of their growth also indicates the quality of the soil. Wild carrot and the ox-eye daisy grow only upon poor soils, or soils that have been robbed of their fertility. Sheep sorrel indicates acid land and the necessity of applying lime to "sweeten" the soil. Bracken, sedge, and moss show that the land needs drainage. Dark green foliage and large size of plant and leaf are good indications of abundant nitrogenous plant food in the soil; and yellowish foliage and sparse, stringy growth shows lack of this material.

Weehawken, wē-hā'kēn, N. J., town in Hudson County; on the Hudson River, and on the New York, Ontario & Western and the West Shore R.R.'s; opposite New York. It is one of the largest, if not the largest, coal depot in the United States. It has the coal docks and freight sheds of the Erie Railroad Company, and the coal docks of the Delaware and Hudson Canal Company and the Pennsylvania Company. It has several manufacturing establishments. Two of the Hackensack Water Company reservoirs are located here. Weehawken is known as the dueling place of Alexander Hamilton and Aaron Burr. Pop. (1890) 1,943; (1900) 5,325; (1910) 11,228.

Week, a period of seven days, one of the common divisions of time. The week is not a natural division of time, and the question when, why, and by whom it was first adopted necessarily arises in connection with its actual prevalence. The only natural explanation offered is that it has been adopted as a quarter lunation; but as there is no absolute necessity for dividing the month into four, and a large fraction is

needed to make the weekly square with the lunar periods, this explanation is not satisfactory. The week is, in fact, a much closer division of a year than of a month; but the division of the year into 52 portions is so purely arbitrary that this can hardly suggest the origin of the week. The convenience of some short recurring period or cycle of days is obvious, and it is the prevalence alone, and not the occurrence of a particular cycle, that has to be accounted for. The practice of antiquity on the subject does not seem to have been so uniform as is sometimes supposed. Among the nations who adopted the week as a division of time, the Chinese, Hindus, Egyptians, Chaldeans, Jews, Persians, and Peruvians have been mentioned, but in some cases the antiquity of the practice is doubtful, and in others the name has been applied to other cycles than that of seven days. The nations with whom the weekly cycle has been traced with certainty to the greatest antiquity are the Egyptians and the Hebrews. With the former we only know of its existence, but with the latter it had a much more important character. Their earliest records speak of its existence, and refer it to a period previous to that of the nation itself. Laban, the uncle of Jacob, alludes to the week as an established measure of time in Gen. xxix. 27. The origin of the week is further ascribed in the Jewish Scriptures to the creation of the world, and is wrought into the institutions of the nation in a variety of ways, but particularly by the consecration of the seventh day to the worship of the Creator. The Hebrew word for week is of a general signification, and applies equally to a period of seven days, seven months, and seven years, each of which had a particular celebration attached to it in the Hebrew ritual, hence the use of days to represent years in the prophetic writings is according to the natural genius of the language. The number seven had a mystic significance attached to it in the symbolism of the Jewish religion in a variety of other ways. The Romans and Greeks each divided the month into three periods (see *CALENDAR*), and were not acquainted with the week till a late period. The Romans, however, had for civil uses, as the arrangement of market-days, a cycle of eight days, the ninth day being the recurring one, instead of the eighth, as with us. The use of the week was introduced into the Roman Empire about the first or second century of the Christian era from Egypt, and had been recognized independently of Christianity before the Emperor Constantine confirmed it by enjoining the observance of the Christian Sabbath. The names given by the Romans to the days of the week, and which have pervaded Europe, were derived from the planetary system, which was supposed to consist of the sun, moon, and five planets, Mars, Mercury, Jupiter, Venus, and Saturn. With the Mohammedans the week has also a religious character, Friday being observed by them as a Sabbath. It is supposed by some authorities that they introduced the week to India. The Chinese week is said to consist of five days, named after the five elements, iron, wood, water, feathers, and earth. See articles on the different days of the week.

Weekes, wēks, Henry, English sculptor: b. Canterbury 1807; d. 29 May 1877. He was for many years the principal assistant of the sculptor Chantrey, was elected to the Academy

in 1863 and became professor of sculpture there in 1873. Besides the earliest bust of Queen Victoria (1837) he executed statues of Latimer, Cranmer, Bacon, Charles II., and others.

Weeks, Edwin Lord, American artist: b. Boston 1849; d. Paris 17 Nov. 1903. He was a pupil of the Beaux-Arts (Paris), of Gérôme, and Bonnat, and sketched and painted in Cairo, Jerusalem, Damascus, Tangier, and other parts of the Orient, obtaining there material for the genre-scenes from Eastern life with which he won his reputation. A frequent exhibitor at the Salon, he obtained honorable mention there in 1885. Among the other distinctions which he received were the diploma of honor at the Berlin international exhibition in 1891, and a special medal and prize in 1896 at the Empire of India exhibition (London). Specimens of his work are in the Pennsylvania Academy of Fine Arts, Philadelphia, and the Corcoran Gallery of Washington. Among his paintings are: 'A Cup of Coffee in the Desert'; 'Jerusalem from the Bethany Road'; 'Pilgrimage to the Jordan'; 'Scene in Tangier'; 'Arab Story-Teller' (exhibited at the Centennial Exhibition, Philadelphia, 1876); 'Departure for the Hunt—India'; 'Moorish Camel-Driver.' He also wrote 'From the Black Sea Through Persia and India' (1895), and 'Episodes of Mountaineering' (1897).

Weeks, Feast of (Heb. *Shabwoth*), a name employed by the Jews for the second of the great Hebraic religious festivals. It is thus called from the fact that it forms the culmination of the seven weeks succeeding the Passover feast. Primarily it appears to have been connected with the celebration of the end of the harvest, but later also with the giving of the Law on the fiftieth day after the departure from Egypt. In the New Testament it is called Pentecost (q.v.), the Greek word (*πεντηκοστή*) signifying fiftieth (from *πεντα*, day).

Weems, wēms, Mason Locke, American Protestant Episcopal clergyman: b. Maryland about 1760; d. Beaufort, S. C., 23 May 1825. He began the study of medicine, but gave it up and went to London, where he was educated for the clerical profession, but found no bishop in England to admit him to holy orders. There was then no Anglican bishop in America, and the professional plans of Weems were obstructed by peculiar difficulties. (For an account of them see McMaster's 'History of the People of the United States', Vol. I.) Returning to this country, he preached at different places, apparently never having a regular charge, although it has been said that the rectorship of Mount Vernon parish (there was no such parish) was held by him before the Revolution, as claimed by himself; also that he officiated in the old Pohick Church, of which Washington was an attendant, which indeed he may have done, but not until long after Washington's attendance there had ceased. About 1790 he became a book agent for Mathew Carey (q.v.), and traveled through the South selling works, some of which were his own. He made himself popular by exercising his talents for comedy and his skill with the violin, probably diverting and (through his sermons) exhorting the people by turns. A book of his own writing which he offered for sale was 'The Drunkard's Looking Glass, Reflect-

ing a Faithful Likeness of the Drunkard in Sunday Very Interesting Attitudes, with Lively Representations of the Many Strange Capers which he cuts in Different Stages of His Disease' (6th ed. 1818). His 'Life of Washington,' by which he is best known, first appeared in 1800, and during the 19th century the number of its editions exceeded 70. The traditional conception of Washington rests mainly upon this work, as do the story of the cherry-tree and other anecdotes which historians reject, most of which first appeared in the 5th edition (1806). His other publications, all more or less tawdry and inaccurate, include: 'Life of General Francis Marion' (1805). 'The Philanthropist, or Political Peacemaker Between All Honest Men of Both Parties' (10th ed. 1809); 'God's Revenge Against Gambling' (3d ed. 1816); 'Life of Benjamin Franklin with Essays' (1817); 'Life of William Penn' (1819); 'Hymen's Recruiting Sergeant, or the New Matrimonial Tattoo for Old Bachelors' (7th ed. 1821); and 'The Bad Wife's Looking Glass, or God's Revenge Against Cruelty to Husbands' (2d ed. 1823).

Weenix, Jan, yān vā'nīks, THE YOUNGER, Dutch painter, son of the following: b. Amsterdam 1644; d. there 20 Sept. 1719. He painted landscapes, animals, flowers, and fruit, but excelled in the representation of dead game and hunting scenes. His pictures of this class are unrivaled by any productions of the Dutch school, and command large prices. He finished with extreme neatness, and exhibited a clear and brilliant coloring and a wonderful knowledge of chiaroscuro.

Weenix, Jan Baptist, Dutch painter: b. Amsterdam 1621; d. Ter May, near Utrecht, 1660. He was instructed by Abraham Bloemart and Nicolas Moijert, and at 22 visited Rome, where he acquired a reputation by his Italian seaports and landscapes with architectural accessories. The last 12 years of his life were passed in Holland. He was a rapid painter, having been known to finish three half-length portraits with accessories in a single day, and excelled in history, portrait, animal, landscape, and marine painting, being on the whole most distinguished in the last named department.

Weeping Cross, a cross of stone or wood, erected at the side of a road, at which penitents prayed and wept for their sins. Hence the old English saying, 'To return by weeping cross,' that is, to return in sorrow from some message or undertaking. As these crosses were removed in England when that country became Protestant, the saying is now obsolete, but is met with in old writers.

Weever (variant of weaver, or of the obs. *wiwer*, from Lat. *vīpera*, viper), a fish of the genus *Trachinus*, two species of which are recognized: *T. vīpera*, 5 to 6 inches in length, and *T. draco*, 10 to 12 inches. These fishes possess sharp opercular and dorsal spines, with which they can inflict a painful wound. The sting is believed not to be poisonous, but it is very similar to that of the sting-ray (q.v.). The name weever is hence applied to any of the *Trachinidae* (q.v.).

Weevil, a general name applied not only to various genera of adult beetles but also to their larvæ. They form a group *Rhyncho-*

phora, or snout-beetles, so called from the characteristic production of the head in the form of a prominent snout, bearing the elbowed antennæ at the sides and the small mouth at its tip. There are several families, but most of these beetles belong to the Curculionidae, which is said to include upward of 600 genera and 20,000 species. All of them are vegetarians and the larvæ are little white or yellow, fat, footless grubs which mostly live within the tissues of plants, and are especially destructive to nuts, seeds and fruits. One of the most conspicuous and harmful is the cotton boll weevil, *Anthonomus grandis*. It is about one-fifth of an inch long and may be differentiated from related species by the fact that the tibiae of the first pair of legs are provided with two small spines. Immediately after transforming from the pupal state the color is reddish but some time after emergence the color becomes considerably darker. The grub-like larvæ are considerably longer than the adults, strongly curved, white with pale yellowish heads. The eggs are deposited in punctures made by means of the beak of the female weevil in the buds (called squares) and bolls. The larvæ devour the interior. Infested squares practically invariably fall to the ground but bolls always remain attached to the plant. In the case of the squares, of course, the fruit is ruined. In case of bolls only the infested like or apartment is destroyed. The life cycle is completed in about 20 days and there is an inextricable confusion of generations. The winter is passed in the adult stage, the individuals flying to the woods or seeking shelter in debris around or inside of the cotton fields.

This insect, probably originated in Central America. It was introduced into the United States near Brownsville, Texas, about 1892. By 1895 it became established as a serious pest and has continued to spread northward and eastward. It has now extended about 585 miles northward from Brownsville and to a point within 10 miles of the Mississippi River in Louisiana. Five counties in southwestern Arkansas have also become invaded. Efforts to stay the progress of the weevil have been unavailing, but an effective method of mitigating its damage has been perfected. The methods of destroying or controlling recommended by the Department of Agriculture are the removal of the plants from the fields in the fall when there is no prospect of any more fruit being allowed to mature; early planting, the use of early maturing varieties, the application of fertilizers and intensive cultivation.

The grain-weevil (*Sitophilus granarius*) is a little beetle of a dark red color, and about ¼ inch long. The eggs are deposited on wheat after it is stored, and the larvæ burrow therein, each larva inhabiting a single grain. The rice-weevil (*S. oryzae*) destroys rice and Indian-corn in a like fashion. This latter species has four red spots on the elytra or wing-covers. Another species (*Calandra palmarum*) infests palm-trees. It is common in Guiana, and attains a length of two inches, the larvæ burrowing in the pith of the trees. *C. sacchari* inhabits sugar-canes. The genus *Rhynchites*, of which the grape-weevil (*R. bacchus*) is an example, as the head broad behind. This species devas-

tates the growing vines, and strips them of their leaves. The plum curculio (*Conotrachelus nenuphar*) causes great damage to plums, cherries, and other stone fruits. The eggs are laid one at a place in the young, forming fruit, upon the flesh of which the larva feeds, causing it to drop prematurely or to become "wormy." The beetle is less than one fifth of an inch long and dark brown spotted with black and yellow. The familiar chestnut-worm is the larva of *Balaninus rectus*, remarkable for the great length of the snout, which exceeds the short robust body and which is adapted for piercing the thick burrs of the young chestnuts, permitting the deposition of an egg in the kernel. Related species of the genus infest other nuts. Equally troublesome to fruit-growers are the species of *Anthonomus*, of which one pretty little species (*A. signatus*) causes great damage to the Sharpless and other staminate varieties of strawberry. This species attacks the flowers, and the larvæ feed upon the pollen. Still quite different in its habits is the potato weevil or potato-stalk borer (*Trichobaris trinitata*), the larva of which bores passages in the stems of potatoes and wild plants of the same family. The clover-weevil (*Phytosomus punctatus*) has green larvæ which differ from all of the foregoing in living exposed to the air and light, though they feed chiefly at night. They eat the leaves and as they hibernate in the ground and begin to feed almost as soon as the clover sprouts in the spring they become most serious pests. The imagoes are nearly $\frac{1}{3}$ inch long, thick-bodied and short-snouted, with strongly knobbed antennæ.

To the family *Bruchidae* belong the extremely destructive pea and bean weevils, which have the proboscis short and curved down on the breast and the antennæ not elbowed. They are small beetles with stout bodies and the swollen abdomen often projecting beyond the tips of the wing-covers. Unlike the Curculionidæ, which become quiescent and assume an appearance of death, these beetles are extremely active and fly when disturbed. The larva of the pea-weevil (*Bruchus pini*) damages peas, the eggs being laid when the peas are ripening. They destroy much of the substance of the grain, lessen its germinating power and pupate in its interior. The mature insect is of a black color, marked with white spots, and about $\frac{1}{4}$ inch long. The *B. pini* was at one time so destructive in North America that its ravages threatened to wholly exterminate the pea crops. Several species are named corn-weevils, from their destructive effects in granaries. *B. granarius* also attacks peas, and one species infests the cocoanut. The bean-weevil (*B. fabæ*) is plain brown in color but otherwise similar.

Weevils are very difficult to control on account of their small size, inconspicuousness, and the fact that the destructive larvæ are generally beyond the effective reach of insecticides. The best measures consist in the total destruction by burning of all infested fruits, nuts, or stems, the digging or plowing in the late fall of the ground in which the pupæ hibernate, and in the case of the pea and bean weevils the fumigation with carbon bisulphide of all infested seed.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); Saunders, 'Insects Injurious to Fruits' (Philadel-

phia 1883); Smith, 'Economic Entomology' (Philadelphia 1896).

Weeyot. See WISHOSKAN.

Wei-Hai-Wei, wā'h'i'wā', China, a seaport and British naval and coaling station, in the province of Shantung, near the eastern extremity of the Shantung peninsula, 40 miles east of Chee-foo. It lies on the south shore of the entrance to the Gulf of Pe-chi-li, opposite Port Arthur on the north shore, about 100 miles distant. During the Chino-Japanese war, the Japanese destroyed a Chinese fleet here and captured the town, which they evacuated early in 1898. By a convention of 1 July 1898 the port of Wei-hai-wei, together with the adjacent waters and some neighboring territory, was leased to Great Britain for so long a period as Russia shall hold Port Arthur (q.v.). The leased territory includes the island of Liu Kung, all the islands in the bay, and a belt of land to miles wide along the whole coast of the bay; area, 280 square miles; pop. 120,000. By the terms of the lease Great Britain has sole jurisdiction within the limits of this territory, but within the walls of the city Chinese officials may exercise such authority as is not inconsistent with the defense of the territory. The British government may also erect fortifications and carry out other defensive works in a defined region lying outside of the leased territory. Chinese war-vessels retain the right to use the waters. Wei-hai-wei is not to be fortified, but is intended to be a naval base, place of exercise, and sanatorium for the British squadron on the China station.

Weidner, wīd'nēr, *Revere Franklin*, American Lutheran theologian: b. Centre Valley, Pa., 22 Nov. 1851. He was graduated from Muhlenberg College, Allentown, Pa., in 1869, from the Lutheran Theological Seminary, Philadelphia, in 1873, and after being ordained to the ministry was pastor at Phillipsburg, N. J., 1873-8, and at Philadelphia 1878-82. He was professor of English, history, and logic at Muhlenberg in 1875-7, and in 1882-91 was professor of dogmatics and exegesis at Augustana Theological Seminary, Rock Island, Ill. In the last named year he accepted the presidency and the chair of dogmatic theology at the Chicago Lutheran Theological Seminary, both of which posts he still (1904) holds. He has published: 'Commentary on the Gospel of Mark' (1881); 'Biblical Theology of the Old Testament' (1886); 'Annotations on the General Epistles' (1897); 'Theologia; or the Doctrine of God' (1903); 'Studies in Exodus' (1903); etc.

Weigand, vī'gānt, *August*, Belgian musician: b. Belgium; d. Oswego, N. Y., 26 May 1904. He began his musical career as organist of Saint Giles' Church, Liège, and subsequently long presided at the organ of the Sydney, N. S. W., Town-Hall—the largest instrument in the world. His achievements as organist and composer won for him a professorship in the Royal Conservatoire at Liège. He came to the United States in 1903, gave numerous concerts, opened the large organ at Brown University, and was appointed to open the grand organ at the Louisiana Purchase Exposition, Saint Louis, in June 1904. In a dozen years he gave throughout Europe more than 1,800 concerts. He was the recipient of various distinctions, and was generally known as Chevalier Weigand.

WEEVIL.

1. Uninjured cotton bolls about to open.
2. Cotton boll practically destroyed by boll weevil.
3. Larva of boll weevil in square.
4. Side view adult boll weevil.
5. Adult boll weevil, wings spread.

WEIGHING MACHINES

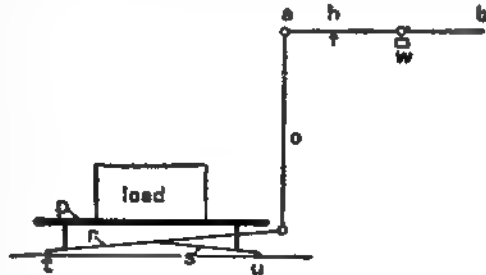
Weighing Machines, mechanical devices for ascertaining the weight or mass of objects. It is to be understood, however, that the element thus determined is a relative value, and is entirely independent of the magnitude of the force of gravity or the tendency of a body to fall. For example, the force of gravity decreases with elevation, but a commercial unit of weight such as a "pound" is the same at the foot as it is at the top of a mountain. In the usual method of determining weights of this character, a "unit of mass" is first adopted, and then a "set of weights" procured, each of which represents a certain predetermined number of the mass units. With these, by the aid of a machine so constructed as to be capable of establishing an equilibrium between any number of the weights and the article being weighed, the ratio of the weight of the article to that of the adopted unit of mass is determined, and this ratio identified with the ratio of the masses. Such machines may be conveniently arranged in three general classes—"equal armed" balances, "unequal armed" balances, and "spring" balances.

Equal armed balances are represented by the various forms of "scale-beams," in which the scale-pans are below the beams, and the "counter-machines" in which the scale-pans are above the beam, both forms operating by establishing an equilibrium between a known and an unknown weight. Unequal armed balances are represented by those consisting of a single steelyard, and those formed by combinations of unequal armed levers and steelyards, such as platform scales and weighbridges, in which a small known weight at one end of a multiplying beam counterbalances a heavy unknown weight at the other end. Spring balances operate on the principle that, when an elastic body is subjected to a tension, the amount of elongation increases with the increase in the force of tension. In the simplest form, it consists of a spiral spring of hard steel of a high elastic limit. As commonly used it is suspended from a fixed point by a hook at its upper end, while its lower end is bent into a hook, which is crossed by another hook to which the article to be weighed is attached. An index attached to the spring and moving along the face of a graduated plate, indicates the amount of tension in terms of the adopted unit of weight. The contrivance is so arranged that the axis of the spiral is always a plumb line, under tension or at rest, and is capable of weighing only an amount within the elastic limit of the spring. Their capacity is generally small, and they are extensively used in butcher shops, and for other purposes where a high degree of accuracy such as may be obtained by lever balances is not required. On the other hand, the various forms of dynamometers employed for registering the pull of locomotives, are made with enormous capacities. In this connection the "torsion balance" may be conveniently mentioned, although in reality it is a machine generally used for the purpose of measuring horizontal forces, rather than weights as here understood. In its simplest form it consists of a beam, supported by a wire stretched horizontally which passes through its centre of gravity. When twisted by the application of a weight to the beam, the elasticity of the wire acts the part played by the weight of the beam in an ordinary balance. For measuring horizon-

tal deflections caused by electric, magnetic, and other forces, the wire is stretched vertically.

For all forms of weighing machines of the equal armed type with small capacities, such as counter-scales, chemical and assay balances, etc., see **BALANCES AND SCALES**.

The majority of the machines of large capacity used for weighing heavy loads such as carts loaded with grain, hay, coal, building materials, etc., operate on the principle of the lever, and belong to the class designated as unequal-armed balances. They are also known as "decimal balances," and as usually arranged, the ratio between the small known weight on the weighing beam and the unknown weight on the platform or bridge, is indicated in multiples of ten. Such a balance consists of a lever (*ab*), suspended at (*h*), and connected by the rod (*o*), with two levers (*r*) and (*s*), hinged at (*t*) and (*u*), respectively. A platform (*p*), resting by means of standards upon the levers (*r*) and (*s*), accommodates the load which is counterbalanced on the long arm of the weighing beam or lever (*ab*), by a sliding weight—(*w*). When a load is placed upon the platform (*p*),



Decimal Balance.

the levers (*r*) and (*s*), are depressed, and exert a downward pull on the short arm of the weighing beam through the rod (*o*), with a consequent lifting of the long arm. This pull is counterbalanced by sliding the weight (*w*) along the long arm until it is brought into a horizontal position. The weighing beam being graduated with an adopted unit of weight and fractions thereof (usually pounds), the weight of the load on the platform is ascertained by a simple direct reading of the graduated scale. In the smaller scales, the weight (*w*) equals one pound, and counterbalances a load of 100 pounds upon the platform, but it is evident, that by varying the number of levers, and the relative lengths of their arms, any desired ratio between the load and the counter weight may be readily obtained. In scales used for weighing loaded wagons and cars, the ratio varies from 1 to 500, or 1 to 1,000. Cattle scales are capable of weighing from 10 to 200 head of cattle at a single operation, and the capacity of grain scales ranges upward of 500 bushels, while the large iron and steel manufacturing plants and gun shops, employ machines with capacities exceeding 100,000 pounds. The machine at Watervliet Arsenal, Troy, N. Y., used for weighing guns, has a capacity of 300,000 pounds.

Continuous weighing machines are employed to weigh automatically, material carried by conveyors, picking bands, etc., without interfering with the travel of the bands, and without requir-

ing the tipping of the material, such as grain, sugar, coal, etc., into a weighing hopper and back again, with the attendant amount of breakage or loss, and the annoyance of dust. The principle upon which they operate is applicable to tramways.

Bibliography.—For further information consult *Weighing Machines*, W. Airy, London Institute of Civil Engineers, 1892; *Continuous Weighing Machines*, 'Engineering,' London, Vol. 72, pp. 482-483; and the various Engineering Magazines.

W. MORRY, JR.,
Consulting Civil Engineer.

Weight Thermometer. See THERMOMETER.

Weights and Measures. The science of measuring and weighing holds an important place in the factors of civilization. There is scarcely an art more universal or more vitally important. Weights and measures are fundamental necessities of commerce, industry, and science. Measurement is required in the exploration of lands and waterways, in their location and transfer, in the work of construction of buildings, bridges, railroads, and other engineering works, in the manufacture of foods, in the preparation of compounds, and in the purchase, shaping and sale of materials. Weights and measures are essential to all barter of goods. Here, the accuracy may range from the "heap" or "pile" of ancient times to the one one-hundredth of a cent used in cotton and spelter quotations "on change," estimates of value which we call prices being based on a specified weight of gold. Weights and measures are essential in all construction whether the precision be the "rule of thumb," or the millionth of an inch in optical work, or the one ten thousandth of an inch in the manufacture of fine machinery. The pharmacist with his weights compounds the prescriptions which mean health and life to the sick. In the extractive and compounding industries, weights and measures are used to determine the essential proportions in analyses and compounds, and precision is the main condition of reproducibility of results. Likewise the manufacturer must accurately weigh, measure, and test his materials to secure perfect construction. Surveying and navigation would be very primitive were it not for the rigorous measurements of base lines, accurate triangulation, precise leveling, including even such delicate measurements as the variation of latitude. Weights and measurements will in fact be found necessary in the discovery and in the statement of industrial and scientific facts of all kinds. The birth of the exact sciences was coincident with the development and application of quantitative measurements to the phenomena of nature, and the rapid growth of modern science has since been parallel with that of precision. James Watt was one of the earliest to suggest international standards which would enable scientific results when published in terms of such standards to be intelligible and reproducible the world over. Precise and uniform standards made possible the interchangeability of parts in machinery, first practically applied by Eli Whitney and to-day one of the most important principles in manufacturing.

Classification.—Weights and measures ordinarily include length, area, volume, capacity, and weight (or mass). These are relatively the most important kinds of measures used by

man. However, within the last half century when such products as power, electric current, heat, light, refrigeration, and services of other kinds have entered the world's markets as commodities for manufacture, purchase, and sale,—the scope of weights and measures has widened to include units used in the measurement of velocity, pressure, energy, electricity, temperature, and illumination. Technical requirements also resulted in a series of compound units such as the knot, a unit of speed for vessels of one minute of the earth's circumference per hour; the ton-mile used in transportation rates and statistics; the foot-pound, a unit of energy; the dyne, the international unit of force, and other units of the centimetre-gram-second system of scientific units in use throughout the world. Such compound units are multiplying apace with the technical needs, and have proven of inestimable value and economy by the facility and precision which they afford in conveying exact quantitative results of experiment and observation. With advancing needs the units of weight and measure have extended to microscopic and to telescopic dimensions. The millimicron of the physicist and the still smaller Angstrom unit of which it requires 254,000,500 to make one inch, are used in spectrum analysis for measuring the dimensions of light waves, while on the other hand the "earth's orbit" is used by astronomers in measuring stellar distances. In addition, the "light-year" is used for the greatest distances, this unit being the distance which light traverses in one year, or about 6,000,000,000,000 miles. With the extension and division in size of units, the kinds of instruments and methods of application of the units themselves have multiplied. Almost every occupation has its particular units, its methods of measurements, and its special measuring instruments. A few of the thousands of the latter may be cited, such as the common rulers, carpenter's folding rules, draughtman's scales, surveyor's chains, engineer's tapes and level rods, lumberman's log rules and board measures, the merchant's yard stick, the tailor's tape, the shoe, glove, and hat-measures, machinist's scales, measuring bars, micrometers, micrometer calipers, limit gauges of ring and plug types, end and line standards of precision. In measuring volume we have the standard capacity measures, milk measures, beer measures, wooden dry measures, a vast variety of standard flasks, glass graduates such as burettes, pipettes, and other volumetric apparatus of the druggist, physicist and chemist, the gauging rods for casks and cargoes, gasometers reading in cubic feet, tanks and reservoirs with graduated scales reading volumes directly. For weighing, we have even balance scales, steelyards, platform scales, spring balances, all ranging from the most delicate analytical balances to the master scales for weighing canal boats and railway trains. Scales are especially designed for every particular need, and the countless varieties attest the high state of the art of weighing and its great importance in industrial and scientific work. Such instruments have multiplied in form and number, and the demand for them has grown so rapidly that the manufacture of weights, measures, and measuring instruments forms in itself a whole group of industries.

With the development of units of measure of the order of inter-molecular distances on the

WEIGHTS AND MEASURES

one hand and of almost interstellar distances on the other, and the multiplication of kinds of instruments used in measurement has come the invention of a large variety of measuring appliances which automatically indicate the result upon a scale. Of this class are thermometers, spring balances, aneroid barometers, pressure gauges, speedometers, and indicating meters of all kinds. Computing scales not only indicate the weight but show the computed total price of the article at each possible price per pound. Many of this class of instruments also make continuous record of the measurements showing by a curve the values at successive moments of time. Of this type are the automatic recording instruments used to record temperature, air pressure, sunshine, rainfall, electrical quantities as well as tide recorders, anemometers and many others. Equally interesting are those measuring instruments like dividing engines, trip scales, or trip measures which besides measuring definite lengths, weights or quantities automatically perform certain operations such as graduating a scale, delivering or tipping a certain weight of grain, or delivering certain volumes of liquids. Closely related are those devices which integrate quantities delivered or magnitudes measured, such as the small map wheels which measure distances on maps, or the planimeters which measure areas within irregular contours, and all forms of gas and water meters, integrating rain gauges, integrating watt meters for measuring electric power consumed. These instruments usually indicate on a dial the total number of units measured since the last zero setting.

Metrology.—Many sciences and industries have given the science of metrology their best thought and labors. Chemistry opened up new chapters in the science of the refractory metals, developing iridium and platinum of purity requisite for the world's fundamental standards of mass and length, producing in conjunction with metallurgy the remarkable "invar" nickel-steel alloy having practically a zero temperature coefficient of expansion, the alloy manganin free from temperature coefficient for electrical resistance, the Jena glass, a material for measuring flasks and thermometer bulbs which practically eliminates temperature disturbances. To optics and the glass industry we are indebted for the microscopes, telescopes, polariscopes, and other optical instruments which form essential parts of modern measuring apparatus. Optical methods based upon the interference of light waves have made possible the detection of changes of dimension far beyond the power of the microscope to detect. By such methods plane glass surfaces are produced having errors of less than a millionth of an inch, and in the interferometer is provided the most delicate and sensitive length-measuring instrument known to man. Metallurgy and engineering have developed methods of fusing, casting, and tempering materials to be used in measuring apparatus, and have developed the accurate machining of such instruments. Astronomy has given the precision measurements of time, the "second" being the unit of time in the international C. G. S. system of units. Mathematics has devoted a large section of its science to the theory of observations and added rigor in their adjustment, and in the elimination of accidental errors, and by developing the theoretical side of precision measure-

ments has rendered the greatest service to metrology.

Unit Standards.—The standards of length and mass are fundamental. From there and the unit of time practically all other standards are derived, either directly or indirectly. The derived standards include those used in the measurement of volume, density, capacity, velocity, pressure, energy, electricity, temperature, illumination, and the like. The production of copies, multiples, and subdivisions of the fundamental standards, the construction of the derived standards, and the comparison of the standards used in scientific work, manufacturing and commerce with the fundamental or derived standards of the government are functions of the Bureau of Standards in the United States and of similar bureaus in other countries. In the United States the standard of the weights and measures of trade is maintained through the State, county, and city scales of weights and measures with an efficiency dependent upon local administration. For more precise purposes, however, uniformity and precision are attained and maintained only by regular reference of the local standards to the fundamental standards of the government, at the Bureau of Standards in Washington.

The units of weight and measure in the United States are practically those used in the colonies prior to the formation of our government. While Congress has never definitely authorized the weights and measures in common use, it has sanctioned their use by its act of 14 June 1836, providing that accurate copies of the yard, pound, etc., be furnished as standards to each State of the Union. The constitutional power "to fix the standard of weights and measures," vested in Congress (I. 3, § 5, U. S. Constitution) has rarely been exercised, so that legislation on weights and measures has been confined to the individual States, and in this manner numerous differences in usage have grown up in the several States, although the same general system of weights and measures prevails throughout the country. The customary units of length are defined by reference to the yard. The yard itself was formerly defined as the length of a certain brass bar, the standard yard, kept at the Office of Standard Weights and Measures in Washington. Since 1893 the yard is defined in terms of the international metre. The yard appears to have been a unit of length in England since very early times. The name signified in Old English and in Anglo-Saxon (gyrd) a rod or stick. A standard bronze yard of 1496 still exists in England, having been used for the verification of other yards until 1588, when a new standard was made which is also in existence to-day. This yard, known as the Winchester standard, was the legal standard in England until 1824, when new standards, the Imperial standards, were authorized.

When the Coast Survey was organized it was found necessary to have a definite standard of length, and an 82-inch bar was secured from the instrument maker, Troughton, of London. This bar was nearly a copy of Troughton's scale, and had not been compared with the British standard yard, but the distance between the 27th and 63d inch marks on the bar was taken as representing the standard yard, and was made the basis of the standards sent out

WEIGHTS AND MEASURES

In accordance with the act of Congress of 1836. In 1834 the British Imperial yard was destroyed by fire and when a new standard had been prepared, copies of it were made, two of which were presented to the United States in 1836. These copies were compared with the Troughton scale, and the latter was found to be 0.00083 inch longer than the new Imperial yard at the standard temperature of 62° F. One of the copies was then accepted as standard by the United States Office of Standard Weights and Measures in place of the Troughton scale. This copy of the Imperial yard was the standard on which all measurements of length in the United States were thereafter based until 1893, when the yard was defined in terms of the International prototype metre. The matter had been left entirely to the Treasury Department, which had adopted different yards from time to time, assumed to be equal to the British Imperial yard.

The copies of the Imperial yard had shown noticeable changes relative to the standard when subsequently compared, and this led to the belief that the Imperial yard itself was not constant. Shortly after the arrival of the National prototype metre, a careful determination of the relation of the Imperial yard to the International metre at the Office of Standard Weights and Measures showed that the relation differed from that legalized in 1866 by less than the uncertainty of the comparison, and it was decided to adopt the metre as the fundamental standard of length and to define the yard in terms of it. Not only is the constancy of the length of the Imperial yard suspected, but in addition the lines, which are about 1-1000 of an inch wide, are much too broad for present requirements. On the other hand, the International metre and its copies satisfy the rigorous requirements of modern metrology. The kilogram was also declared to be the fundamental standard of mass. The present standards of the United States are therefore independent of the British standards and in part differ from them. The prevalent idea that the weights and measures in common use are identical with the British Imperial system is therefore erroneous. The United States yard is slightly longer than the Imperial yard and this inequality extends to all of its subdivisions and multiples. The present material standards of the United States are the National prototype metre No. 27 and the National prototype kilogram No. 20, received by the President of the United States on 2 Jan. 1890. These are accurate copies of the International prototype metre and kilogram which are the fundamental standards of length and mass for the entire world. The latter standards are preserved at the International Bureau of Weights and Measures in accordance with the International Metric Convention of 1875, now signed by all the leading countries of the world, including England, Russia, and the United States. These countries jointly maintain and direct the work of this bureau through official representatives forming an international committee, composed of eminent scientific men from all parts of the world.

The units of length, and the derived units of area, volume, and capacity are derived from the International metre in the ratio of 1 metre = 39.37 inches (Law of 28 July 1866). Since 1893 the Office of Standard Weights and Measures and the Bureau of Standards which superseded

that office have used the equivalent 1 yard = 3600-3937 metre (by order approved 5 April 1893). This action fixed the values, inasmuch as the reference standards are as perfect and unalterable as human skill could make them. Besides the yard, the units of length most universally employed in the United States at the present time are the inch, foot, and mile.

The "inch" is the 1-36 part of the yard and like it has been in use since ancient times. The name (derived from the Latin *uncia*, meaning the twelfth part) occurs in Anglo-Saxon in the form of *ynce*. It probably originated only as a convenient subdivision for the foot. Lengths shorter than one inch are commonly expressed in fractions of an inch. Two methods of subdivision are in common use; among builders and wood workers it is customary to use the binary subdivisions, half, quarter, eighth, etc., but machinists also divide the inch into tenths, hundredths, and thousandths. The inch is usually denoted by the symbol " "; but botanists use the symbol ' for the inch. The "miner's inch" is a rather vague unit for the flow of water varying from 1.36 to 1.73 cubic feet per minute, and is the flow of water through each square inch of an orifice under varying heads of water. The "inch or gauge of cream" is fixed by Iowa statute as equal to $\frac{1}{4}$ gallon.

The "foot" is legally defined as $\frac{1}{36}$ of the yard or 12 inches. As its name implies it was probably based on the length of the human foot. Almost every nation, ancient and modern, has had a unit called the "foot," its value differing somewhat, as might be expected with a unit of so crude an origin. Most countries, however, have now adopted the metric system, the foot being discarded as an official measure, though still widely used in English countries. Lengths shorter than one foot are usually expressed in inches and fractions of an inch, but among surveyors and civil engineers it is quite common to use decimal fractions of the foot. The foot is generally denoted by the symbol ' , but botanists use the symbol ° to denote feet. Some artisans use the foot and the inch but not the yard, others the yard and its binary divisions, but not the foot or inch. Thus the foot and inch are used to the exclusion of the yard in building, while the yard and its binary subdivisions to the exclusion of the foot and inch in measuring cloth, and surveyors in surveying public lands use neither the yard, foot nor inch. (See *LINE*.)

The "statute" or "land mile" is the unit most commonly used for longer distances and is equal to 5,280 feet. The name is from the Latin *mille passuum*, 1,000 paces, the Roman pace being a double step and consequently about five feet in length. This mile was used by the Anglo-Saxons. Almost every European nation has had a unit called the "mile" but widely at variance with one another, ranging from about $\frac{1}{3}$ of the United States mile (Holland) up to seven United States miles (Norway). The British statute mile is slightly shorter than the United States mile. Since the introduction of the metric system, these old miles are being superseded by the kilometre, which is a fixed and definite unit the world over.

The following units of length are used in special work and are arranged in the order of their magnitude. Metric units are not included, although their use is steadily increasing. (See *METRIC SYSTEM*.)

WEIGHTS AND MEASURES

Mil (.001 inch) is used in electrical work, especially in indicating the cross section of wires.

The point (1-72 inch) is used in designating the sizes of type, the point system designating the sizes of type by the number of seventy-seconds of an inch height of the type face. The em is a unit of measure used in composition and varies with the size of the type, usually being considered as the square of the face height.

The line (1-12 inch) is little used, mechanics preferring to divide the inch into tenths, hundredths, and thousandths. It is used by printers and by botanists, the latter denoting the line by the symbol λ . The line "button measure" is 1-40 inch as defined in the tariff act.

The barleycorn ($\frac{1}{3}$ inch) is an old unit still surviving in shoemakers' shoe sizes, these being graded by thirds of an inch or barleycorns, in a system of thirteens.

Four units based upon the "hand" are sometimes used. These are the nail ($2\frac{1}{4}$ inches) for measuring cloth, originally the distance from the end of the thumb nail to the joint at the base of the thumb, and later fixed as 1-16 yard; the palm (3 inches) includes the breadth of the hand exclusive of the thumb; the hand (4 inches), originally the breadth of the palm, is used in measuring horses and is almost exactly one decimetre; the finger ($4\frac{1}{2}$ inches) is about the length of the middle finger and is only used as a rough unit in cloth measure. This should not be confused with the finger breadth used in measuring charges of powder.

The surveyor's link (7.92 inches) is the length of one link or 1-100 part of a surveyor's chain, and is used in the survey of lands.

Quarter (9 inches) is sometimes used in measuring cloth (more frequently in Great Britain) to designate a quarter of a yard. A unit of the same length called the span was originally half a cubit, but probably has not been used in modern times as an officially recognized unit.

The engineers' link (12 inches) used as a unit in engineering is the hundredth part of the engineers' chain, and is decimally divided. The tenth of the engineers' link is 1.2 inches and is easily confused with the inch.

The pace is a conventional unit for measuring distances and is measured from the heel of one foot to that of the other, and a full pace measures about one yard. This is the value of the United States military pace, double time, with a cadence of 3 steps a second. The regulation military pace quick time is 30 inches with a cadence of 2 steps per second. The Roman pace was a double step of about 5 feet.

The ell, a unit still referred to but seldom used, having a value of 45 inches, varying, however, in different places.

The fathom (6 feet) is used in measuring depths of water or mines. The name comes from an Anglo-Saxon word *faethm*, signifying "embrace," and originally meant the length of rope between the two hands when the arms were held outstretched.

The rod, perch, or pole, is equal to $5\frac{1}{2}$ yards and is used in measuring land. It has varied in different places from 5 to 8 yards and is supposed to have been the length of the ancient goad used to measure the width of the first furrow.

The surveyors' or Gunter's chain (22 yards)

was so chosen that ten square chains might equal exactly one acre. This chain is the official unit prescribed for the use of surveyors surveying public lands under the supervision of the surveyor general.

The engineers' chain (100 feet) is used in engineering, and is decimally divided into feet, tenths, and hundredths of a foot. The use of the two chains in many cases for the same land for different purposes requires reduction tables. On account of the direct relation to the foot, the engineers' chain is becoming very widely used.

The bolt for measuring cloth is generally given as 40 yards, though the name means a roll of definite length simply. The customary length of the bolt varies with different fabrics and manufacturers.

The skein for yarn is often defined as 120 yards. Its length varies, however, according to the material and the locality. Consult International Yarn Tables, New York (1903).

The United States cable's length (720 feet), used by mariners, is 120 fathoms as recognized by the United States navy.

The furlong (220 yards) originally meant "length of a furrow," supposed to be the distance oxen could plow without stopping to rest.

The hank is a unit of length for yarn. In this country the length of a hank of cotton is usually 840 yards, while that of linen is 3,000 yards; different lengths, however, are also in use.

The nautical mile or geographical mile has been defined as 1-60 part of the length of a degree of a great circle of the earth. Since the earth is not a perfect sphere, however, the degree varies in length and this has led to much confusion in usage regarding the nautical mile. The definition accepted by the United States Coast and Geodetic Survey (consult Report of 1881, Appendix 12) is as follows: the 1-60 part of the length of a degree on the great circle of a sphere whose surface is equal to the surface of the earth. This makes the length of the nautical mile 6080.20 feet or 1853.248 metres. The uncertainty in the dimensions of the earth affects the last decimal place given. The nautical mile is often miscalled "knot." The latter term, however, is not a measure of length, but a measure of speed, equal to one nautical mile per hour. The admiralty "knot" of Great Britain is 6,080 feet.

The league is equal to three miles, the land league being equal to three United States statute miles (15,840 feet) and the United States marine league to three nautical miles (18,240.6 feet). Its value varies in different countries. The marine league is the distance from shore over which a country has jurisdiction under international law.

The degree is equal to about 60 nautical miles.

The astronomical unit equal to the mean radius of the earth's orbit or nearly 93,000,000 miles, is sometimes used in stating astronomical distances.

In stating interstellar distances it is sometimes found convenient by astronomers to use the light year, a still larger unit, being the distance traversed by light in one year, or 65,706 astronomical units.

Besides the measures of length given above,

WEIGHTS AND MEASURES

there are numerous very special methods of denoting length in case of special commodities. The thickness of sheet iron and steel is denoted by a system of arbitrary gauge numbers. The numbers in use differ for different products. On 3 March 1893 Congress passed an act establishing a standard gauge for sheet and plate iron and steel for use in the custom service. In this system the gauge numbers indicate thickness, or the weight per unit area. Sizes of wire are also denoted by a special system of arbitrary gauge numbers. The number of different systems which have been used is quite large. Pfeilschmidt's 'Wire and Sheet Gauges of the World' (1895) gives comparative tables for 11 systems of wire gauges. At present the most common gauges in use in this country are the Brown and Sharp gauge and the Birmingham wire gauge. The fineness or coarseness of yarn is denoted by a system of "numbers," which indicate usually the number of hanks of the yarn in question which will weigh one pound. Thus No. 10 yarn (English cotton yarn and spun silk count) is a yarn of such fineness that 10 hanks (of 84,000 yards) are required to make a weight of one pound, or again No. 1 wool (Aberdeen count) is such that one spindle (of 14,400 yards) shall weigh a pound. There are about 24 different systems of counts in use, and in order to introduce uniformity in counting textile yarn throughout the world, the international metric count was approved by the International Paris Conference of 1900. According to this count, No. 1 means that a length of 1 metre will weigh 1 gram, and 100 metres of No. 100 yarn will weigh 1 gram.

In addition to the above there are a large number of special systems of numbering particular commodities such as hats, shoes, gloves, nails, cordage, books, and other articles, too numerous for description. The growing use of the metric system is introducing uniformity and simplicity in commercial transactions and manufacturing as it has done in scientific work.

The units of superficial measure or area are usually the squares of the linear units and as such need but little comment. The circular mil (.7854 square mil) is the area of a circle .001 inch in diameter. One circular inch contains 1,000,000 circular mils, and one square inch contains 1,273,240 circular mils. The square inch is the most common small unit of area, being used in measuring pressures, strength, and other properties of materials, and in engraving, cloth analysis, and many other purposes. The square foot (144 square inches) is also largely used. It is the basis of the board foot which is 144 cubic inches of undressed lumber, being reckoned as one square foot of one inch board, or its equivalent. The "square" is a unit used in carpentry for flooring, ceiling, and shingling, and contains 100 square feet, architects' and builders' measure.

In surveyors' measure 1 acre = 10 chains = 160 square poles = 100,000 Gunter's or surveyors' links. The acre (43,560 square feet) was probably as much land as could be tilled in a day and therefore of rather indefinite extent until later times. It is a unit of the same order as the French *journal* and the German *Morgen*. The acres of various countries differ in size, for example, the Irish acre, Scotch acre, Cheshire acre, Cunningham acre, and the Imperial acre.

In subdividing public lands in the United States, the lands are laid out in townships. One township = 36 sections or square miles = 144 quarter sections = 23,040 acres. The "homestead" is a free grant of public land having a maximum area of one quarter section or 160 acres. In the Philippine Islands, the "homestead" is 64 hectares, which is almost identical with the homestead as defined above.

Among the more important units of volume are the cubic inch, the cubic foot, the cubic yard, and the cubic mile. The cubic inch is practically the smallest unit of volume based directly on linear units. It is very largely used. The cubic foot (1,728 cubic inches) is used in engineering to express volumes of gas, water, or other solids. In some States, such as Washington and Colorado, the cubic foot is established by statute as the legal unit for measuring the volume of water. A special system of units is used in the measurement of wood; 144 cubic inches or 1 foot square of one inch board equals one board foot. A timber foot, however, is 1,728 cubic inches or one cubic foot. A cord foot is a pile of wood 1 x 4 x 4 feet. A cord of wood is 3 cord feet. In the lumber business boards are usually bought and sold by the 1,000 board feet to simplify computation. In New Hampshire, a measure for lumber was adopted in 1866 based upon an "imaginary cubic foot" equal to about 1.4 cubic feet. This unit is also used in parts of Maine and Vermont. Round timber is measured as follows: "A stick of timber 16 inches in diameter and 12 inches in length shall constitute one cubic foot, and the same ratio shall apply to any other size and quantity. Each cubic foot shall constitute 10 feet of 1,000 board feet." In the practical use of this rule it is customary to consider 115 cubic feet equivalent to 1,000 board feet, instead of 100 cubic feet, according to the wording of the statute. In this case the diameter is taken at the middle of the log inside the bark. If the diameter is measured at the small end of the log, 106 cubic feet are allowed for 1,000 board feet. The New Hampshire rule is called the Blodgett Rule. The Doyle is the standard of log measurement in Arkansas for logs cut and sold or hauled. A large variety of log rules is in use throughout the country. These are locally accepted as standards, but they differ among themselves in so confusing a manner as to make it impossible to give an accurate and complete statement concerning them. The cubic yard is used largely in engineering and in computing grading, cuts, and fills, a cubic yard being equal to about one load.

The perch, in addition to being a unit of length and a unit of area, is also widely used as a unit of volume of brickwork and masonry. The perch of brickwork, however, is a widely varying unit, ranging from 16½ cubic feet to 25 cubic feet. In Colorado it is 16½ cubic feet, in Philadelphia 22 cubic feet, 25 cubic feet in North and South Dakota, 24½ cubic feet in other places. The latter perch is equal to a section of brickwork 1 x 1½ feet by 16½ feet or one perch in length.

A cord of masonry is usually reckoned at 100 cubic feet, although in some cases it is 96 cubic feet.

The cubic mile is used in expressing very large volumes, such as the silt carried by rivers.

Liquid Measure.—The fundamental unit of

WEIGHTS AND MEASURES

liquid measures in the United States is the wine gallon of 231 cubic inches—a unit abandoned by England in 1824, but now generally adopted by the various States of the Union. The British Imperial gallon measures slightly more than 277 cubic inches, and is the volume of 10 pounds of water under specified conditions. The liquid measures of the United States unfortunately bear no relation to those of England. Much confusion is occasioned by the use of the ambiguous term gallon, as there are in the United States the wine gallon (231 cubic inches), the ale, beer, or milk gallon (282 cubic inches), and the dry gallon, besides the "proof gallon," the unit for internal revenue taxation. The "proof gallon" is a wine gallon of spirits containing one half its volume of nearly pure alcohol at 60° F. and is the basis for computing the United States internal revenue tax. For example, a gallon of spirits containing 40 per cent alcohol would be 80 per cent proof and the number of proof gallons is computed by multiplying the per cent of proof by the number of wine gallons. Wisconsin and Connecticut still retain the dry gallon of 282 cubic inches as a legal standard. New Hampshire and Minnesota definitely retain the ale, beer, or milk gallon of 282 cubic inches, and Maine definitely mentions the same unit among its list of State standards. A recent Minnesota statute (1902) provides that the "Beer and milk measures shall contain the following capacities: The gallon shall contain 282 cubic inches. The half gallon shall contain 141 cubic inches, and the quart one half as much, and the pint one half as much as the quart." The milk gallon thus established is 51 cubic inches larger than the standard gallon used more generally throughout the country. There are thus three different quarts, the dry quart derived from the Winchester bushel, the liquid quart derived from the wine gallon, and the liquid quart derived from the beer or milk gallon. The differences, of course, extend proportionately to all the multiples and subdivisions of these units. The ordinary liquid measures are usually 1 gallon = 4 quarts = 8 pints = 32 gills. In addition to the capacity measurement by volume, the legal weight of a gallon of certain commodities have been fixed by statute in some States, and in several cases by Congress for certain purposes. Thus 12 pounds of strained honey is a legal gallon in Nebraska, 6½ pounds of kerosene (Kansas), and 7½ pounds of kerosene in Ohio, 11 pounds of sorghum molasses (Indiana), 8 pounds of castor oil (Kansas) are all legal gallons of the products named. These legal weights differ among themselves, and do not accord with the true volume of one gallon of 231 cubic inches.

The subdivisions of the gallon, the quart, pint, and gill are largely used in trade. In addition to the general liquid measures enumerated above, apothecaries have a special system of capacity measures based on the volume of the United States liquid pint of 28.875 cubic inches. One pint = 16 United States fluid ounces = 128 United States fluid drams = 7,680 United States minims.

The United States minim is the smallest of the units of volume and is about 0.000376 cubic inch. A minim of pure water weighs about 0.05 grain and corresponds to the "drop," which it approximates in size. The United States

minim is about 4 per cent larger than the British Imperial minim. It is denoted by the symbol *m*.

The drop varies from 0.02 to 0.1 cubic centimetre and is not a fixed unit, but is convenient for use in dispensing very small quantities of liquids. It is not subdivided and its size depends upon the liquid and the method of dropping. The ordinary form of drop pipette of the ophthalmologist delivers drops of about a half United States minim.

The United States fluid dram (60 minims) is equal to ⅙ United States fluid ounce, its volume differing from the volume of one avoirdupois dram of water, from the volume of one apothecaries' dram of water (by weight), and is about 4 per cent larger than the fluid dram in use in Great Britain. It is about 4 cubic centimetres, or an average teaspoonful, and is denoted by the symbol *f*.

The United States fluid ounce (480 United States minims) is the 1-16 part of the wine pint and has a volume of about 1.8 cubic inches. It differs from the British unit of the same name as well as from the volume of the avoirdupois ounce of water and the troy or apothecaries' ounce of water. Other measures of less definite character are often found convenient, such as the teaspoonful, dessertspoonful, tablespoonful, wineglassful, and teacupful. They do not contain exactly the quantities usually given arbitrarily, but more exactly the common spoonfuls contain the following quantities: A tablespoonful, 5 fluid drams or 20 cc.; a dessertspoonful, 2 fluid drams or 10 cc.; a teaspoonful, 60 minims or 5 cc.

Dry Measures.—The dry measures in general use in the United States bear no direct relation to the liquid measures of this country or Great Britain. The following are the ordinary units of dry measure: One bushel = 4 pecks = 32 dry quarts = 64 dry pints. The fundamental unit is the Winchester bushel, a unit abandoned by England in 1824, but still retained in general use in this country. The Winchester bushel has a volume of 2,150.42 cubic inches and is about 69 cubic inches or 3 per cent smaller than the Imperial bushel of Great Britain—a proportionate difference existing in the subdivisions of the bushel. Conflicting State laws render difficult an adequate statement of the status of the "bushel" in this country. Although the standard Winchester bushel contains 2,150.42 cubic inches, Nebraska has established 2,150 cubic inches as the volume of a legal bushel for that State, and other States have made similar changes. Several States adopted the old ale or milk gallon as the capacity of the dry gallon, this being about 5 per cent larger than the corresponding unit derived from the Winchester bushel. Moreover, special bushels have been legally established in many States for particular products, such as the charcoal bushel, which in Connecticut is 2,748 cubic inches, in Colorado 2,500 cubic inches, in Kansas 2,564 cubic inches, in Pennsylvania 2,571 cubic inches, and in Minnesota 2,419.5 cubic inches (or ½ basket). In Vermont "one bushel and three quarters of a peck" are "deemed a bushel of charcoal, lime, or ashes." In some places five pecks constitute a bushel of "screened lump coal." A lime bushel in Minnesota is 2,688 cubic inches. In Pennsylvania, however, it is equal to the Winchester bushel, although the coke bushel is 2,648 cubic

WEIGHTS AND MEASURES

inches. In the adjoining State of Ohio the bushel is 2,688 cubic inches. In Idaho, the bushel of fruit is defined as 2,564 cubic inches and in Missouri as 2,680 cubic inches. Some States require, furthermore, "heaped measure," others "struck measure," the heap sometimes being required to be "as high as the article will admit," and elsewhere "as high as may be without special effort or design," and in still other cases, as in Connecticut, the heaped bushel is definitely fixed as 2,564 cubic inches. The many objections to buying and selling agricultural products by volume, such as the difficulty of detecting error or fraud, the variation in the size of the heap, the ease of packing short quantity in a given volume, the effects of expansion, moisture, or shaking, and the general uncertainty of estimates of quantity based upon volume early led to the practice now quite general, of defining the bushels as definite weights for the different commodities. Unfortunately the matter was left to the several States with the result that the lack of uniformity in legislation and custom has introduced considerable confusion. Not only do the weights fail to equal the true volume of one Winchester bushel, but even for the same commodity and in adjoining States the values are widely at variance. In at least two cases the size of the bushel varies with the time of the year. For a few commodities like wheat and hard coal, the standard weight is fairly general—but for such commodities as fruits and vegetables there is but little uniformity. The values of the various bushels of apples vary by about 10 per cent and for beans and charcoal about the same proportion. The legal weights of the bushel of gooseberries or beets varies by about 20 per cent and for cranberries 17 per cent, for sweet potatoes and buckwheat the variation is about 28 per cent in range. The "bushel" has in fact become merely a name for a miscellaneous group of units varying from State to State and differing for the various commodities, sometimes, as in at least two cases changing with the time of the year. The uncertainty is confusing to trade and precludes the compilation of accurate statistics based upon so variable and ambiguous a term.

The barrel is a convenient receptacle for packing, transporting, and storing commodities. It varies in size, sometimes being defined in terms of units of volume, 6,253¼ cubic inches struck measure in Massachusetts. In other cases it is fixed as a definite number of units of dry measure, 100 dry quarts in New York, five bushels in Tennessee; or in some States as a definite number of liquid gallons, 36 gallons in Arkansas, 42 gallons in Tennessee, or more commonly 31½ gallons. Besides this method of definition the barrel, like the bushel and the gallon, is legally defined for certain commodities in terms of a definite number of pounds. The barrel of flour, for example, is commonly fixed at 196 pounds. Apart from this, but few States have used this method of defining the barrel and that only for a few products. Two hundred and eighty pounds of shelled corn constitute a legal barrel in Connecticut, 200 pounds of pork in Indiana, North Carolina, and Tennessee, 150 pounds of sweet potatoes in Massachusetts. In New York and some other States the several dimensions of the standard barrel are specified, although other forms con-

taining the same volume may be used. The dimensions specified in New York are head diameter 17½ inches, stave length 28½ inches, bulge not to exceed 64 inches outside measure. A barrel of crude oil is usually 31½ United States wine gallons and the barrel of refined oil 42 gallons.

The hoghead (two barrels), the pipe (four barrels), and the tun (eight barrels) are more commonly not intended as definite measures but merely convenient receptacles for liquids in bulk.

The smaller units of dry measure, such as the peck, dry quart, and dry pint, are largely used in retail trade, the pint and quart being used for smaller products like berries.

Avoirdupois System.—The avoirdupois system of weights is used for almost all commodities except the precious metals, chemicals, and jewels. The avoirdupois dram differs from the apothecaries' dram, and the avoirdupois ounce and pound differ from the troy units of the same name. Ambiguity is avoided only by properly qualifying the terms. The use of such unqualified terms as ounce, pound, or ton causes great confusion owing to the uncertainty and ambiguity of the terms. The "avoirdupois pound" or "troy ounce," however, are definite units. The avoirdupois units are as follows:

1 long ton = 20 long hundredweights = 80 long	
1 short ton = 20 short hundredweights = 80 short	
quarters = 2,240 pounds = 35,840 ounces = 173,440 grains	
quarters = 2,000 pounds = 32,000 ounces = 160,000 grains	
drams = 13,680,000 grains	
grams = 14,000,000 grains	

The fundamental unit of the avoirdupois system is the avoirdupois pound derived from the International kilogram, in accordance with the law of 1866 and the executive order of 1893, the value being 453.5924277 grams. The avoirdupois pound was probably derived from the Attic mina of 6845.3 grains Troy, the 1-60 part of the large Attic talent, divided by the Romans into 16 ounces of nearly the same weight as the modern ounce. Congress has never directly legalized any standard of weight except the Troy pound and that only for purposes of coinage. To avoid confusion in comparisons of mass, the ratio of the avoirdupois pound to the Troy pound was fixed at 7,000 to 5,760.

The United States avoirdupois dram (or drachm) is the 1-16 part of the avoirdupois ounce (28.3495 grams). This unit must not be confused with the apothecaries' dram (weight) which is the ¼ part of the apothecaries' ounce or 60 grains. The avoirdupois dram is largely used in the textile industries. The avoirdupois ounce is the 1-16 part of the pound and contains 16 drams. The avoirdupois stone is a denomination often used, especially in England, and varies with different commodity, the most common value being fixed in England as 14 pounds.

The hundredweight (cwt.) is the 1-20 part of the ton. The round hundredweight contains 100 pounds and is sometimes called the "cental," while the long hundredweight contains 112 pounds. This unit is used very largely in fixing transportation rates.

The commercial ton of 2,000 pounds is in very general use throughout the States, but 112 pounds is the legal hundredweight in many places, and 2,240 pounds the legal ton, as in

WEIGHTS AND MEASURES

England. The long ton is the national standard in this country. The gross ore ton contains 2,688 pounds. Great confusion at present exists in the use of the word "ton," as the unqualified term may mean the short ton, long ton, gross ore ton, miner's ton, varying from 2,500 to 3,000 pounds, displacement ton of 35 cubic feet, shipping ton of 40 cubic feet, timber ton of 42 cubic feet, or register ton of 100 cubic feet. The register ton varies in different countries. Accurate statistics covering more than a single State or industry are impossible to obtain, owing to the difference in the values of these units and methods of measurement. The tariff act defines the ton of coal as "28 bushels of 80 pounds each" equal to the long or United States ton, but the statutory ton of coal in Montana is defined as 26½ bushels of 76 pounds each. In some cases the ton is defined as a definite number of cubic feet, for example, 343 cubic feet is a legal ton of hay in North Dakota and Oklahoma, and in New Mexico the ton is defined as 380, 422, or 512 cubic feet, according to the time the hay has been stacked.

Troy Weights.—The Troy weights are as follows: One pound=12 ounces=240 pennyweights=5,760 grains. The Troy pound was legalized in 1828 as the standard unit to be used by the Mint of the United States in the regulation of the coinage. In view of the confusion in the weights and measures of trade, Congress found it important to legalize some particular weight for the use of the Mint, and by the act of 19 May 1828 legalized the copy of the Imperial Standard Troy pound. This copy was procured by Albert Gallatin in England in the preceding year and was received by President Adams 13 Oct. 1827. It was based upon the old Imperial Standard Troy pound of 1752, legalized in 1825. This Troy pound has not been recognized as a legal standard in England since 1855, and was declared illegal, with penalty attached, in 1878.

The grain is the 1-5760 part of the Troy pound, and is the only unit which connects the Troy system with the avoirdupois. A very old English statute (51 Henry III., 1266) provided that the English penny should weigh "thirty-two grains of wheat, well dried, and gathered out of the middle of the ear." Fifteen different values of the grain in different countries are cited, varying from 0.68 to 1.34 United States Troy grains. The Troy grain, as used in the United States, is 0.0648 gram. The diamond grain is 0.8 Troy grain. The Troy grain is practically obsolete in the avoirdupois measures. Fractions of the grain are usually indicated decimally.

The pennyweight is the 1-240 part of the Troy pound. Some 18 different values are recorded, varying from 7.42 grams to 24 United States grains.

The Troy ounce is the highest Troy denomination permitted in England, and is used in stating quantities of silver and other precious metals. In assaying the Troy ounce is frequently divided decimally. The silk Troy ounce according to Troemner is the 1-16 of the Troy pound and contains 360 grains. One hundred and seventy-five Troy ounces equals about 192 avoirdupois ounces.

The units of apothecaries' weights are as follows: One apothecaries' pound=12 ounces

=96 drams=288 scruples=5,760 grains. The apothecaries' pound is equivalent to the Troy pound in the United States, but in England the apothecaries' weights based on the Troy pound were discontinued in 1858 under authority of the medical act, and avoirdupois weights substituted in dispensing medicines. In the United States, the avoirdupois system is largely used in buying and selling drugs, although the metric system is rapidly coming into use and displacing the apothecaries' weights on account of its greater convenience. The apothecaries' grain is used in compounding prescriptions of the more powerful drugs. The United States apothecaries' scruple (20 grains) and the United States apothecaries' dram (60 grains) are still used in compounding prescriptions. The United States apothecaries' ounce (480 grains) is equal to the Troy ounce. The apothecaries' pound (equal to the Troy pound) is rarely used.

The units used in the weighing of diamonds are as follows: One diamond carat=4 diamond grains=64 parts. The carat is the jewellers' unit for weighing diamonds, the name referring to a small hard bean formerly used for that purpose. In view of the variation in the value of the carat in different countries, its weight was fixed by agreement of London, Paris, and Amsterdam jewelers, in 1878, at exactly 205 milligrams. The following varieties of carats should be carefully distinguished: The international diamond carat of 205 milligrams, a definite unit free from ambiguity; the English diamond carat (3.2 Troy grains or four diamond grains) differing, however, in different countries; the old carat (1-24 Troy ounce); the gold carat (about 150 Troy grains); and the gold carat, a ratio equal to 1-24 part by weight used in designating the purity of gold alloys.

Bibliography.—Alexander, 'Universal dictionary of weights and measures, ancient and modern; reduced to the standards of the United States of America' (1867); Chaney, 'Our Weights and Measures. A practical treatise on the standard weights and measures in use in the British Empire' (1897); Oldberg, 'A manual of weights and measures, including principles of metrology; the weights and measures now in use; weight and volume, and their reciprocal relations; weighing and measuring; balances (scales) and weights; measures of capacity; specific weight and specific volume, etc.' (1890); Adams, 'Report upon weights and measures. Prepared in obedience to a resolution of the Senate of 3 March 1817' (1831); 'Table of Equivalents of the Customary and Metric Weights and Measures. Circular of Information of the National Bureau of Standards' (1903); 'Laws Concerning Weights and Measures of the United States. Bureau of Standards' (1904); 'Ready Reference Tables,' Carl Hering (1904).

S. W. STRATTON,
Director United States Bureau of Standards.

Weights and Measures, Foreign.—The following table, which presents a list of all the weights and measures most commonly used in the various countries of the world, alphabetically arranged and with their American equivalent, has been revised (1905) by the officials of the National Bureau of Standards, Washington, D. C.:

WEIGHTS AND MEASURES

WEIGHTS AND MEASURES, FOREIGN.

WEIGHTS AND MEASURES	Where Used	American Equivalent	WEIGHTS AND MEASURES	Where Used	American Equivalent
Almude	Portugal	4.422 gallons	Last	Prussia	112.20 bushels
Ardeb	Egypt	7.607 bushels	Last	Russian Poland	113½ bushels
Arrobe	Paraguay	25 pounds	Last	Spain	4.760 pounds
Aratel or libra	Portugal	1.011 pounds	League (land)	Paraguay	4.633 acres
Arroba (dry)	Argentine Republic	25.3175 pounds	Li	China	2.115 feet
Arroba	Brazil	32.38 pounds	Libra	Argentine Republic	1.0127 pounds
Arroba	Cuba	25.3664 pounds	Libra	Central American countries	1.043 pounds
Arroba	Portugal	32.38 pounds	Libra	Chile	1.014 pounds
Arroba	Spain	25.36 pounds	Libra	Cuba and Venezuela	1.0161 pounds
Arroba	Venezuela	25.4024 pounds	Libra	Mexico	1.01465 pounds
Arroba (liquid)	Cuba, Spain and Venezuela	4.263 gallons	Libra	Peru and Uruguay	1.0143 pounds
Arshine	Russia	28 inches	Libra	Portugal	1.011 pounds
Arshine (square)	Russia	5.44 sq. feet	Libra	Spain	1.0144 pounds
Arel	Morocco	1.12 pounds	Livre	Greece	1.1 pounds
Baril	Argentine Republic and Mexico	20.0787 gallons	Livre	Guiana	1.0791 pounds
Barrel	Malta (customs)	11.4 gallons	Load (timber)	England	Square, 50 cubic feet; unhewn, 40 cubic feet
Barrel	Spain (raisins)	100 pounds	Manzana	Costa Rica	1½ acres
Berkovets	Russia	361.12 pounds	Manzana	Nicaragua and Salvador	1.727 acres
Bongkal	India	832 grains	Marc	Bolivia	0.507 pounds
Bouw	Sumatra	7.096.5 sq. metres	Mauud	India	82.27 pounds
Bu	Japan	0.1 inch	Mil	Denmark	4.68 miles
Butt	Spain	140 gallons	Milla	Nicaragua and Honduras	1.1493 miles
Caffio	Malta	5.4 gallons	Morgen	Prussia	0.63 acres
Candy	India (Bombay)	529 pounds	Oke	Egypt	2.7225 pounds
Candy	India (Madras)	500 pounds	Oke	Greece	2.84 pounds
Canar	Morocco	113 pounds	Oke	Hungary	3.0817 pounds
Canar	Syria	575 pounds	Oke	Turkey	2.84838 pounds
Canar	Turkey	124.7036 pounds	Pic	Wallachia	2½ pints
Canaro	Malta	175 pounds	Picul	Egypt	21½ inches
Carga	Mexico and Salvador	300 pounds	Picul	Borneo and Celebes	135.64 pounds
Catty	China	1½ pounds	Picul	China, Japan, and Sumatra	133½ pounds
Catty (kin)	Japan	1.31 pounds	Picul	Java	135.1 pounds
Catty	Java, Malacca and Sum	1.35 pounds	Pic	Philippine Islands	137.0 pounds
Catty	Sumatra	2.12 pounds	Pic	Argentine Republic	0.9478 feet
Centaro	Central American countries	4.2631 gallons	Pik	Spain	0.91407 feet
Centner	Bremen and Brunswick	117.5 pounds	Pood	Turkey	27.9 inches
Centner	Darmstadt and Zollverein	110.24 pounds	Pund	Russia	36.112 pounds
Centner	Denmark and Norway	110.11 pounds	Quarter	Sweden	1.102 pounds
Centner	Nuremberg	112.43 pounds	Quarter	Great Britain	8.252 bushels
Centner	Prussia	113.44 pounds	Quindal	London (coal)	36 bushels
Centner	Sweden	91.7 pounds	Quindal	Argentine Republic	102.42 pounds
Centner	Vienna	123.5 pounds	Quindal	Brazil	130.06 pounds
Centner	Double or metric	220.46 pounds	Quindal	Chile, Mexico, Peru, and Spain	101.41 pounds
Chetvert	Russia	57.748 bushels	Quindal	Greece	123.2 pounds
Chih	China	14 inches	Quindal	Newfoundland (fish)	112 pounds
Coyan	Sarawak	3.098 pounds	Quindal	Paraguay	100 pounds
Coyan	Siam (Koyan)	2.667 pounds	Quindal	Syria	125 pounds
Cudra	Argentine Republic	4.2 acres	Rottle	Metric countries	220.46 pounds
Cudra	Paraguay	78.9 yards	Rottle	Palestine	6 pounds
Cudra	Paraguay (square)	8.077 sq. feet	Sagene	Syria	5¾ pounds
Cudra	Uruguay	About 2 acres	Salm	Russia	7 feet
Cwt.	Great Britain	112 pounds	Se	Malta	490 pounds
Dessatine	Russia	2.6997 acres	Seer	Japan	0.02451 acres
Dessatine	Spain	1.599 bushels	Shaku	India	1 pound, 13 ozs.
Drachme	Greece	¼ ounce	Sho	Japan	11.9305 inches
Fanega (dry)	Central American countries	1.3745 bushels	Standard	Japan	1.6 quarts
Fanega	Chile	2.575 bushels	Stone	St. Petersburg (lumber)	165 cubic feet
Fanega	Cuba and Venezuela	1.599 bushels	Suerte	Great Britain	14 pounds
Fanega	Mexico	1.34728 bushels	Sun	Uruguay	5.400 acres
Fanega	Morocco	118 pounds	Tael	Japan	1.193 inches
Fanega	Uruguay (double)	7.776 bushels	Tan	Cochin China	590.75 grains, troy
Fanega	Uruguay (single)	3.888 bushels	To	Japan	0.25 acre
Fanega (liquid)	Spain	16 gallons	Tonde	Japan	3 pecks
Feddau	Egypt	1.03 acres	Tondu	Denmark	3.048 bushels
Frail (raisins)	Spain	50 pounds	Tondu	Denmark	1.36 acres
Frasco	Argentine Republic	2.51 quarts	Tsubo	Japan	6 feet square
Frasco	Mexico	2.5 quarts	Tsun	China	1.41 inches
Frasila	Zanzibar	35 pounds	Tunna	Sweden	4½ bushels
Fuder	Luxemburg	264.17 gallons	Tunnland	Sweden	1.22 acres
Funt	Russia	0.9028 pounds	Vara	Argentine Republic	34.1208 inches
Garnice	Russian Poland	0.88 gallons	Vara	Central American countries	32.87 inches
Joch	Austria-Hungary	1.422 acres	Vara	Chile and Peru	33.367 inches
Ken	Japan	6 feet	Vara	Cuba	33.384 inches
Klafter	Russia	216 cubic feet	Vara	Curacao	32.375 inches
Koku	Japan	4.9629 bushels	Vara	Mexico	33 inches
Korree	Russia	15 bushels	Vara	Paraguay	34 inches
Kwan	Japan	8.28 pounds	Vara	Spain	0.914117 yards
Last	Belgium and Holland	85.134 bushels	Vedro	Venezuela	33.384 inches
Last	England	82.52 bushels	Vergees	Russia	2.707 gallons
Last	Germany	4.480 pounds	Verst	Isle of Jersey	711 sq. rods
			Vloeka	Russia	0.663 mile
				Russian Poland	41.98 acres

See also METRIC SYSTEM.

WEIMAR—WEISHAUP

Weimar, vî'mâr. Germany, the capital of the grand duchy of Saxe-Weimar, on the Ilm, 13 miles east of Erfurt. It stands in a beautiful valley surrounded by hills, on ground partly elevated and partly flat. It is irregularly built except in the suburban portions. Its notable public edifices are the grand-ducal palace, a handsome structure erected partly under the superintendence of Goethe: the so-called Red and Yellow castles, now united and occupied by several public departments; the grand-ducal library (in the Green Castle), containing 200,000 volumes and a large collection of maps; the museum; the Stadtkirche, with an altar-piece, one of the finest works of Lucas Cranach, in which he has introduced portraits of himself and Luther and Melancthon; and the modern Gothic town-house. The public monuments comprise the Goethe-Schiller monument in bronze, statues of Herder, Wieland, the composer Hummel, the Grand-Duke Karl August, and various others, and a monumental fountain. Goethe's house is now used as a Goethe National Museum, and Schiller's contains relics of its former distinguished owner. A Goethe and Schiller Archives building was opened in 1896. Goethe and Schiller are interred in the grand-ducal vault in the new cemetery. Stretching away from the palace is a fine park on the banks of the Ilm. Weimar has a gymnasium, a real-gymnasium, academy of painting, school of drawing, normal school, and other educational institutions. It has neither trade nor manufactures of much consequence, the manufactures of iron, wood, straw, leather, and cloth being carried on to some extent, but as the capital of the duchy it is the seat of the legislature and of all the more important courts and public offices. It long ranked as a sort of "German Athens" in consequence of the enlightened patronage which the Duke Karl August (d. 1828) afforded to the four great literary men of Germany, Goethe, Schiller, Herder, and Wieland. Pop. about 30,000.

Weingartner, vin'gärt-nër, Felix, Austrian composer: b. Zara, Dalmatia, 2 June 1863. He studied at the Leipsic Conservatory, having received a government scholarship, and in 1884 his opera, 'Sakuntala,' was brought out at Weimar under the patronage of Liszt. He was musical conductor at Königsberg, Dantzic, and Hamburg in 1884-9, and in 1891 was appointed court conductor at Berlin. Ill health compelled the resignation of this post, and in 1898 he settled in Munich as conductor of the Kaim concerts. He has composed numerous songs, several symphonic poems, the operas: 'Malawika' (1886); 'Genesis' (1892); etc. He has written: 'Die Lehre von der Wiedergeburt und das Musikalische' (1895); and 'Beyreuth 1876 bis 1895' (1897).

Weir, wër, Harrison William, English artist and journalist: b. Lewes, Sussex, 5 May 1824; d. London 4 Jan. 1906. He learned the art of wood-engraving, but disliking it, turned to painting, and his first exhibition at the British Institution was in 1843. He was the last survivor of the original staff of the London 'News' and was engaged on the 'Graphic,' 'Pictorial Times,' 'Black and White,' and other London periodicals. He was an authority on the correct delineation of domesticated animals, was noted for his paintings

of country life, and as an illustrator of books and periodicals. He wrote and illustrated: 'The Poetry of Nature'; 'Every-day Life in the Country'; 'Our Cats and All About Them'; etc. Perhaps his greatest achievement was his work 'Our Poultry and All About Them' (1903), the writing and illustrating of which claimed his attention for more than 20 years.

Weir, James, American physician and author: b. Owensboro, Ky., 17 Oct. 1856; d. there, 9 Aug. 1906. He was graduated from the University of Louisville in 1878 and studied medicine there, and in New York. He published: 'Religion and Lust' (1897); 'The Dawn of Reason' (1898); 'Intelligence in the Lower Animals' (1898).

Weir, John Ferguson, American painter and sculptor, son of R. W. Weir (q.v.): b. West Point, N. Y., 28 Aug. 1841. He was a pupil of his father and became a member of the National Academy in 1866. Since 1869 he has been professor of painting in the Yale School of Fine Arts. As a sculptor he is known by his statues of President Woolsey and Prof. Silliman of Yale, and in addition to many portraits he has painted 'The Gun Foundry'; 'The Forging of the Shaft'; 'The Column of St. Mark's, Venice'; etc.

Weir, Julian Alden, American artist, son of R. W. Weir (q.v.): b. West Point, N. Y., 30 Aug. 1852. He studied with his father, and at Paris, with Gérôme, became a member of the Society of American Artists in 1877 and a National Academician in 1886. He has made a specialty of portraits and genre, his 'Idle Hours,' now in the Metropolitan Museum, New York, receiving the \$2,000 prize of the American Art Association, and his 'Breton Interior' obtaining a second class medal at the Paris Exposition of 1889. About 1887 he abandoned his former grave manner and has since been known as one of the Impressionist school.

Weir, Robert Walter, American artist: b. New Rochelle, N. Y., 18 June 1803; d. New York 1 May 1889. After studying under Jarvis he began portrait painting in 1821 and then studied in Florence under Benvenuti, 1821-3. In 1829 he became a National Academician and was professor of drawing at West Point 1837-79. He was of especial prominence as a historical painter, and among his works are the 'Embarkation of the Pilgrims' (1845) in the rotunda of the Capitol at Washington; the 'Church of the Holy Innocents' (1847), Corcoran Art Gallery, Washington; and 'Peace and War,' painted for the chapel at West Point.

Weir, a dam or dike across a river or stream to raise the level of the water for the purpose of diverting it to drive machinery, irrigate land, or to render the upper portion of the stream navigable, or for some other purpose. A weir is constructed of stone, or, as in the United States, of timber, crossing the river at right angles or obliquely. The term is also applied to an escape pipe for carrying off surplus water from a reservoir.

Weirs, Fishing. See POUND-NET FISHING.

Weishaupt, vis'howpt, Adam, German mystic: b. Ingolstadt 6 Feb. 1748; d. Gotha 18 Nov. 1830. He was the founder of the Society of the Illuminati (q.v.). Educated at Ingolstadt, he there became in 1772 extraor-

inary professor of law, and in 1775 professor of natural and canon law. His appointment to the latter post brought him into collision with the clergy, especially the Jesuits, as after the suppression of their order he became their bitter enemy, although he had been educated by them. He formed the plan of uniting a large number of men together to sustain certain perfectionist views, and his instruction-room soon became a nursery of his doctrines. In 1785 he was obliged to leave Ingolstadt, and retired to Gotha, where he was afterward made councillor of state by the duke. His most important writings are: 'Geschichte der Verfolgung der Illuminaten' (1786); 'Das verbesserte System der Illuminaten' (1787); 'Pythagoras, oder Betrachtung über die geheime Welt- und Regierungskunst' (1790); 'Materialien zur Beförderung der Welt- und Menschenkunde' (1850); 'Ueber Staatsausgaben' (1820); and 'Ueber das Besteuerungssystem' (1820).

Weismann, vis'män, August, German biologist: b. Frankfurt-on-the-Main 17 Jan. 1834. After studying medicine in Göttingen University he was clinical assistant at Rostock in 1856-7, and in the course of the three years 1858-60 visited Vienna, Italy, and Paris, devoting himself especially to studies in the natural sciences. He lived for a year at Schaumburg Castle as body physician to the Archduke Stephen of Austria, and in 1863 went to Gießen to prosecute his zoological studies under Leuckart. Having qualified as a lecturer in the University of Freiburg, he was appointed extraordinary professor there in 1866, and ordinary professor in 1873. His first published work was a treatise on the 'Development of the Diptera' (1864). It was followed by a work 'On the Influence of Isolation on the Formation of Species' (1872), and 'Studien zur Descendenztheorie' (1875-6). This work, translated into English, in 1882 by Prof. Meldola, under the title 'Studies in the Theory of Descent' (with a preface by Charles Darwin), treats of several important phenomena in natural history from the standpoint of a thorough believer in the doctrine of natural selection. His 'Beiträge zur Naturgeschichte der Daphnoiden' (1876-9) and 'Die Entstehung der Sexualzellen bei den Hydromedusen' (1883) are valuable contributions to the developmental aspect of zoology. A series of treatises followed, in which he developed his characteristic theories, among them being 'Ueber die Vererbung' ('On Heredity'), 'Ueber die Dauer des Lebens' ('On the Duration of Life'), 'Ueber Leben und Tod' ('On Life and Death'), 'Die Kontinuität des Keimplasmas als Grundlage einer Theorie der Vererbung' ('The Continuity of the Germ-Plasm as the Basis of a Theory of Heredity'), 'Die Bedeutung der sexuellen Fortpflanzung für die Selektionstheorie' ('The Significance of Sexual Reproduction for the Theory of Selection'), 'Ueber den Rückschritt in der Natur' ('On Retrograde Development in Nature'), and 'Amphimixis.' These have appeared in an English translation under the title 'Essays upon Heredity and Kindred Biological Problems' (Vol. I 1889; Vol. II. 1892). Weismann's other works include: 'Das Keimplasma' (1892), in English as 'Germ Plasm' (1893); 'Die Allmacht der Naturzüchtung' ('The Omnipotence of Natural Selection, 1893); 'Aeusserer Einflüsse als Entwick-

elungsreize' ('External Influences as Stimuli to Development,' 1894); 'Neue Gedanken zur Vererbungsfrage' ('Fresh Thoughts on the Question of Heredity,' 1895); and 'Ueber Germalselektion' ('On Germinal Selection,' 1896). See HEREDITY; WEISMANNISM.

Weismannism, the essential teaching of August Weismann (q.v.), sometimes referred to as "Neo-Darwinism." Interest and controversy have gathered mainly round his answer to the question, "How is it that a single cell of the body can contain within itself all the hereditary tendencies of the whole organism?" In all theories of heredity (q.v.) biologists have assumed that characters acquired by the individual are transmitted to offspring. Thus Weismann denies, and while biologists have concerned themselves with speculation as to the mode by which such transmissions are effected, he challenges them to prove that they are effected at all. The burden of proof is thus thrown upon his opponents, whose assumptions must give way to experimental evidence, which alone can determine, and that only after protracted record of cases, whether individually acquired characters are transmitted or not. Death, he contends, is not a primary attribute of living matter; the protozoans, or one-celled organisms, being immortal in so far that they do not die naturally. The protozoan, a microscopic jelly-like, apparently—not really—structureless mass, with no seeming unlikeness of parts, multiplies by division. Each half becomes a complete individual, and grows in like manner as the whole to which it belonged, till it also divides, and so on with the multiplication of protozoans *ad infinitum*. It cannot be said of either half that one is parent and the other offspring, for both are of the same age, and only, in a limited sense, as the subdivisions into separate individuals are repeated, can we speak of succession of generations. In these processes there is nothing analogous to death. "There are," Weismann says, "no grounds for the assumption that the two halves of an amoeba are differently constituted internally, so that, after a time, one of them will die while the other continues to live. Observations show that when division is almost complete the protoplasm of both parts begins to circulate, and for some time passes backward and forward between the two halves. A complete mingling of the whole substance of the animal, and a resulting identity in the constitution of each half, is thus brought about before the final separation." Consequently, there is unlimited persistence of the individual: potential, although not absolute, immortality so long as life lasts on the earth.

While the one-celled organisms are thus immortal, only the reproductive cells of the metazoans, the many-celled, are mortal. How has this come about? Weismann accounts for it by the failure of certain protozoans to divide equally, whereby unlikeness of parts and differences of position of parts resulted. "The first multicellular organisms were probably clusters of similar cells, but these units soon lost the original homogeneity. As the result of mere relative position there arose division of labor, some of the cells were especially fitted to provide for the nutrition of the colony, while others undertook the work of reproduction." Clearly, those on the outside, being exposed to

the direct and constant action of their surroundings, would be the media of nutrition, and the builders-up of the cell-commonwealth. So the result of this cell-clustering would be that the cells fell into two classes, body cells and germ-cells. While the body cells were solely concerned with the nutrition of the organism, losing in this specialization of function the power of reproduction, that power became concentrated in the germ-cells, or, speaking more precisely, in the germ-plasm, which is located in the nucleus of the germ-cell. It is these germ-cells which are the immortal part of the metazoans. With increasing subdivision of function there has been increasing modification of the organism, but the two-fold classification of the somatic or body cells and the germ-cells has remained. The death of the body cells is involved in the ultimate failure to repair waste, because a worn-out tissue cannot forever renew itself, and because cell-division has its limits. In brief, death is the penalty paid for complexity of structure. As it is impossible for the germ-cell to be, as it were, an extract of the whole body, and for all the cells of the body to despatch particles to the germ-cells whence these derive their power of heredity (the fundamental idea of Darwin's theory of pangenesis, q.v.), the germ-cells, so far as their essential and characteristic substance is concerned, are not derived from the body of the individual, but directly from the parent germ-cell. Heredity, Weismann contends, is secured by the transference from one generation to another of a substance with a definite chemical and molecular constitution—in other words, by the "continuity of the germ-plasm." This germ-plasm (which, Weismann's critics argue, runs perilously near a metaphysical concept) is assumed to possess a highly complex but extremely stable structure, so stable "that it absorbs nourishment and grows enormously without the least change in its complex molecular structure." Of this germ-plasm it is further assumed that a small portion contained in the parent egg-cell is not used up in the construction of the body of the offspring, but is reserved unchanged for the formation of the germ-cells of the following generations. Only variations of the germ-plasm itself are inherited, and it is upon these variations that natural selection operates. Variations are due not to the influence of external condition nor to use or disuse of organs, but to sexual conjugation. This process combines two groups of hereditary tendencies derived from the mingled germ-plasms of the male and female parents, resulting in those individual differences which form the material from which new species are produced by the action of natural selection. Those differences multiply in geometrical ratio.

The sum of the matter is that natural selection (q.v.) is the dominant factor, that use and disuse of parts and the action of the environment count for nothing, or, at the most, for but a little. (See *USE AND DISUSE*.) Here and there Weismann makes concessions as to the modifying influences of body cells on the germ-cells, and as to the ultimate origin of hereditary individual differences in the direct action of surroundings, which are a partial surrender of his main contention as to the isolation of the germ-plasm. It is not easy to reconcile the theory of an insulated germ-plasm with

the ceaseless manufacture, secretion, and expulsion of germ-cells, the materials of which are derived from the materials nourishing the entire organism, nor with the subtle influence of the nervous system on the reproductive organs.

Perhaps the most serious difficulty in Weismann's theory is in the reconciliation of psychological evolution with the continuity of the germ-plasm. For the researches of Spencer, Balfour, and others have demonstrated that the nervous system had its origin in modifications of the primitive skin due to the direct action of the environment. Be this as it may, the wide-reaching sociological significance of the doctrine of heredity—which may be regarded as the physical correlate of determinism—gives an importance to the labors of Weismann that cannot be overrated, and makes urgent the record of extended observations on the lines already laid down by Galton.

Consult: Haeckel, 'Generelle Morphologie' (1866); Darwin, 'Variation Under Domestication' (1868); Brooks, 'The Law of Heredity' (1883); Virchow, 'Descendenz und Pathologie' (Virchow's Archiv, ciii, 1886); Eimer, 'Die Entstehung der Arten' (1888); Galton, 'Natural Inheritance' (1889); Romanes, 'An Examination of Weismannism' (1893); Spencer, 'A Rejoinder to Prof. Weismann' (1894); Hertwig, 'The Biological Problem of To-day' (1894). For critiques of Weismann, see Eimer, Virchow, *op. cit.*; Spencer, 'Factors of Organic Evolution' (1886); McKendrick, 'General Physiology' (1888); Vinea, 'Nature,' xl. pp. 621-26; Turner, 'Nature,' xl. pp. 526-33; and Mivart, 'Nature,' xli. pp. 526-33.

Weiss, John, American clergyman: b. Boston 28 June 1818; d. there 9 March 1879. He was graduated at Harvard in 1837, in the winter of 1842-3 studied at Heidelberg, Germany; was graduated in the last named year at the Harvard Divinity School, and settled as minister of a Unitarian church in Watertown, Mass. His anti-slavery utterances having disturbed the harmony of his pastorate, he resigned, and in 1847 became minister of a Unitarian society in New Bedford, Mass., but was soon compelled by reason of ill health to retire. Again in 1859-70 he was minister of the Watertown church, from which he finally withdrew in order to pursue his literary work. He was one of the most brilliant of the New England reformers and transcendentalists, and his writings display a mind at once mystical and scientific, strongly rationalistic on religious subjects, but endowed with a fine poetic power of interpretation, which he applied to religious history and symbolism, as well as to questions of philosophy and life, to which he brought prophetic insight and fervor. His publications include: 'Æsthetic Prose' (1845), a translation of Schiller's philosophical and æsthetic essays; 'Life and Correspondence of Theodore Parker' (1864); 'American Religion' (1871); 'Wit, Humor, and Shakespeare' (1880); and 'The Immortal Life' (1880).

Weissenfels, vis'sen-fels, Germany, a town of Prussia, in the province of Saxony, on the Saale, 20 miles south of Halle, with manufactures of sugar, machinery, paper, porcelain, shooes, woolen fabrics, gold and silver articles, etc. It has a 17th century castle, and a church containing the remains of Gustavus Adolphus. Pop. about 30,000.

WEITSPEKAN INDIANS—WELD

Weitspekan (wit'spĕk-an) Indians (from *Weitspek*, the name of one of their towns). A linguistic stock of North American Indians, comprising several small tribes collectively known as the Yurok, occupying the lower Klamath River in California from the mouth of the Trinity down. On the coast Weitspekan territory extends from Gold Bluff to about six miles above the mouth of the Klamath. The Chilula are an offshoot of the Weitspek, living to the south of them, on Redwood creek to a point about 20 miles inland, and from Gold Bluff to about midway between Little and Mad rivers.

Weitzel, vit'sĕl, Godfrey, American military engineer: b. Cincinnati, Ohio, 1 Nov. 1835; d. Philadelphia, Pa., 19 March 1884. He was graduated from West Point in 1855, became assistant professor of engineering there in 1859, was promoted lieutenant in 1860, and appointed chief of engineers in the Department of the Gulf. He was engaged in the defense of Fort Pickens, April-September 1861, later in that year was chief of engineers in the Department of the Ohio, and he accompanied Butler's expedition to New Orleans in that capacity. He became brigadier-general of volunteers in 1862, successfully conducted the Lafourche campaign, and defeated the Confederates at the battle of Labadieville. He was transferred to the Army of the James in April 1864, as chief engineer, and engaged in constructing defenses of Bermuda Hundred and Deep Bottom. He participated in the actions in Swift's Creek, Drewry's Bluff, and in the siege of Fort Harrison, and in November 1864 he was promoted major-general. He was second in command in Butler's unsuccessful expedition against Fort Fisher, and in March and April he was in command of the troops north of the Appomattox, with which he took possession of Richmond on 3 April. He was brevetted major-general in the regular army in 1865 and assigned to command the Rio Grande district, Texas. In 1866 he was mustered out of the volunteer service, appointed major in the regular army in that year, and was subsequently engaged in river and harbor improvements. He was advanced to be lieutenant-colonel of engineers in 1882.

Welbeck Abbey, England, the seat of the Duke of Portland, in Nottinghamshire, three miles south of Worksop. It occupies the site of an old Premonstratensian abbey, and came into the possession of the Portland family by marriage in 1734. It stands in a park 10 miles in circumference, and is a stately Palladian edifice of mainly the 17th and 18th centuries, but was greatly enlarged about 1864 by the fifth duke, to whom it owes its semi-underground picture gallery, ball room, and riding-school, the last 385 feet long, 104 feet wide, and 51 feet high.

Welch, Ashbel, American civil engineer: b. Nelson, N. Y., 4 Dec. 1809; d. Lambertville, N. J., 25 Sept. 1882. He was engaged as an engineer on the Lehigh Canal in 1827; was made chief engineer of the Delaware and Raritan Canal in 1835, and afterward planned the route and constructed the Belvidere and Delaware Railroad. In 1862 he became manager of the Pennsylvania railroad lines in New Jersey, and subsequently was made president. He introduced the block system (q.v.) in railroading in the United States, and published papers on

economics and civil engineering. He was elected president of the American Society of Civil Engineers in 1881.

Welch, Philip Henry, American humorist: b. Angelica, N. Y., 1 March 1849; d. Brooklyn, N. Y., 24 Feb. 1889. From 1882 to 1884 he was attached to the staff of the *Rochester Post Express*, and then removing to New York was employed by the *Sun*. He was prominent among the humorous press writers of his time and was an able satirist. He published 'The Tailor-Made Girl' (1888); and 'Said in Fun' (1889).

Welch, William Henry, American pathologist: b. Norfolk, Conn., 8 April 1850. He was graduated from Yale in 1870 and from the College of Physicians and Surgeons in New York in 1875. He studied pathology abroad, becoming in 1878 demonstrator of anatomy at the Bellevue Hospital Medical College, New York. Since 1884 he has been a professor of pathology at Johns Hopkins University. He is an eminent authority on bacteriology and pathology and is the author of 'General Pathology of Fever' and numerous professional papers.

Welcker, vĕl'kĕr, Friedrich Gottlieb, German archaeologist: b. Grünberg, Hesse, 4 Nov. 1784; d. Bonn, Rhenish Prussia, 17 Dec. 1868. He was educated at Gießen, and in 1806-9 was a tutor in the family of Wilhelm von Humboldt at Rome. In the last named year he accepted the chair of archaeology at Gießen and in 1816 became professor at Göttingen, a position he resigned in 1819 to accept the chair of archaeology at Bonn. Political troubles in 1832 caused his dismissal, but he was shortly afterward recalled and occupied the post until 1861 when he retired. As a classical scholar Welcker held high rank, his extensive writings on Greek art, history, and mythology are of great and lasting value, 'Die griechische Tragödie mit Rücksicht auf den epischen Cyclus geordnet' (3 vols., 1841) is perhaps his greatest work. He prepared editions of Alcman, Hipponax, Philostratus' 'Imagines,' Theognis, Hesiod's 'Theogony,' and 'Kleine Schriften' (6 vols.). Among the most notable of his other works are: 'Aechnische Trilogie' (1824); 'Der epische Cyclus' (1835-49); 'Alte Denkmäler' (1849-64); 'Griechische Götterlehre' (1863); etc. Consult: Kekulé, 'Das Leben Friedrich Gottlieb Welckers' (1880).

Weld, Theodore Dwight, American philanthropist and educator: b. Hampton, Conn., 23 Nov. 1803; d. Hyde Park, Mass., 3 Feb. 1895. He was the son of Ludovicus and Eliza (Clark) Weld, and of lineal descent from Jonathan Edwards. He entered Phillips-Andover Academy, but left school because of impaired sight. He was one of the 63 original founders of the American Anti-Slavery Society, and in 1833 was secretary of that society; and in 1830 he was agent of the Society to Promote Manual Labor in Schools. He entered Lane Theological Seminary, Cincinnati, Ohio, and taught colored youth evenings. He was conspicuous for unselfish charities and fair dealing, and did not hesitate to denounce slavery and the slave trade openly and publicly. He left the seminary when the trustees suppressed the local anti-slavery organization and began a course of lectures. He was repeatedly mobbed, but his commanding

presence and athletic attainments, as well as his fearless and wonderful eloquence, enforced respect; at Granville, Ohio, when advised that the church would be burned if he lectured as advertised, he informed the trustees that he would then speak from its foundations; to threatening letters he replied: "Come, but bring your own winding sheets, which I cannot supply"; six undisturbed lectures followed. At Painesville, Ohio, such was his eloquence that the leader of the mob kicked in the head of the bass drum with which he had thought to drown the speaker's voice. In 1836, his voice partially failed him, but he taught school and used his pen vigorously. In 1838 he married Angelina Emiline, daughter of Judge John Grinke, of South Carolina, who, having become a Quaker in 1835, emancipated her inherited slaves. He edited the American Anti-Slavery Society's publications in Washington, D. C., and was confidential adviser with Congressmen who favored abolition of slavery in the District. In 1854 he established a school at Englewood, N. J., for the joint education of white and black youth; in 1864 removed to Hyde Park, Mass., and aided in founding the Historical Society, the public library and the school system. He was one of the most intimate friends of the poet Whittier, and participated in the celebration of Whittier's 80th birthday, on which occasion Elizur Wright, a former secretary of the Anti-Slavery Society, and Arnold Buffum, who escorted Frederick Douglass to England, the only survivors of the famous 63 men of 1833, were present. In 1837 he published 'The Bible on Slavery' and 'Abolition of Slavery in the District of Columbia'; in 1839, 'American Slavery as It is from the Testimony of 1,000 Voices'; and in 1841, in London, 'Slavery and the Slave Trade in the United States.'

Of his eloquence, the late President Joseph F. Tuttle of Wabash College, Indiana, said: "He was the Thunderer of the West," and as late as 1863 Rev. S. J. May, of Syracuse, N. Y., wrote: "If Weld could only again take the platform, Wendell Phillips is his only possible rival in the cause of liberty."

The town of Hyde Park celebrated the centennial anniversary of Weld's birth in 1903, in their new library building in the Historical Society's apartment, which, in memoriam, bears the name "Weld Hall."

HENRY B. CARRINGTON,
Cor. Sec. Hyde Park Historical Society.

Welde, weld, Thomas, American Puritan clergyman: b. England about 1590; d. there 23 March 1662. Graduated from Cambridge in 1613, he took orders in the English Church and was minister at Terling, Essex, 1624-31. Being there deprived of his living on account of his Puritan views, he came to New England, arriving in Boston 5 June 1632, and in July was ordained as the first minister of the church at Roxbury, becoming a colleague of John Eliot (q.v.) in the following November. At the trial of Anne Hutchinson (1637) he was one of her opponents and with John Eliot and Richard Mather engaged in preparing the version of the Psalms, commonly known as the 'Bay Psalm Book,' the actual title of which was 'The Book of Psalms faithfully translated into English Metre' (Cambridge, 1640), the first book printed in New England. Weld was sent with Hugh

Peters to England in 1641 as colonial agent, a position he filled till his dismissal in 1646. He was afterward pastor at Gateshead, England (1649), and in 1662 was driven from his living on account of his nonconformity. He published 'A Short Account of the Rise, Reign and Ruin of the Antinomians, Familists, and Libertines that Infected the Churches of New England' (1644). This controversial tract was answered by John Wheelwright (q.v.) in his 'Mercurius Americanus' (1645).

Welding is the intimate union produced between the surfaces of two pieces of malleable metal, when heated almost to fusion and hammered together. This union is so close that when two bars of metal are properly welded the place of junction is as strong, relatively to its thickness, as any other part of the bar. Practically, iron is the only metal welded. To weld bar iron to another piece of iron requires an intense white heat. See also **ELECTRIC WELDING**.

Welding, Electric. The heat of an electric arc may be employed in fusing or welding metals, or the heat given out in the body of metal acting as a resistance to the passage of a heavy current, without any arc or spark, may effect that result. The arc method appears to have been first employed by De Meritens in 1881. In this instance leaden pieces designed to be united in the form of storage battery plates were arranged together as an extended positive electrode, and an arc was drawn between them and a negative carbon rod manipulated by means of an operating handle. Part of the heat energy of the arc served to melt the lead and cause union of the adjacent pieces, but much the larger proportion of the energy escaped by radiation and convection. The electric arc was thus akin to a gas blowpipe as commonly used in lead-burning in the construction of tanks for the chemical industries. Following De Meritens, heating by electric arcs has been applied to the fusing and welding of metals, notably of iron and steel, by Bernardos and Olszewski, Coffin, and others. When, as in the Bernardos and Olszewski method, the carbon electrode is made positive to the work, carbon is transported through the arc and is likely to enter the metal undergoing the process, which constitutes the negative pole. This addition of carbon may render iron or steel hard and unworkable, and cause cracks to be formed during the cooling of the fused mass at the joint or filling. By the employment, instead of carbon, of an electrode of the same metal as that of the work, Slaviennoff overcame this difficulty. The gradual melting of the metal electrode furnishes metal for forming joints, or for repairing or supplementing castings which are defective; such as those which are incomplete or contain blowholes. More recently the work is made the positive pole and this results in a greater proportion of the energy than formerly being expended in heating the metal undergoing the operation. Inasmuch as the conditions of energy supply for sustaining the arc, are but little different from those often found in the commercial operation of arc lamps from constant potential mains, arc welding may often be practised by connections made to such mains. A choking or steadying resistance is put in series with the fusing arc in a branch from direct current lines at a potential difference

WELDING

of 200 volts or thereabout. With work such as that to which the Bernardos and Olszewski method has been found to be applicable, the current in the arc may vary from 150 amperes up to 500 or more. The potential across the arc itself will generally be from 100 to 150 volts. With the metal electrode used by Slavienoff the current needed will be greater and the arc potential less than the above amounts. It appears that in certain cases the current may even surpass 4,000 amperes.

While a moderate application of these arc processes for fusing and welding iron and steel has been made, the range of operations to which they are suited is somewhat limited and their success depends largely upon the skill of the workman. He must protect not only his eyesight from the glare of the large arc, but also the surface of his body, and must avoid the irritating vapors which arise there from the flame. At the same time vigorous ventilation can not be employed, for motion of the air tends to disturb the arc and render the work more difficult. A large proportion of the energy is radiated or carried off in the hot gases from the arc. To these energy losses must be added that due to the use of the steady resistance for obtaining stability in the current of the arc. On the other hand the appliances needed for arc fusing or welding are simple and the source of current energy often conveniently found in existing electric circuits.

Werdermann, in 1874, proposed to deflect an electric arc formed between the usual carbons by a jet of air, forming thereby an electric blowpipe. More recently Zerener has in a similar way employed an arc deflected by a magnet as a sort of blowpipe for welding iron. In addition, the curious electric heating action first published by Hobo and Lagrange, has been proposed for welding metals. If a negative electrode of a direct current circuit having a potential of 100 to 150 volts, is of small surface relatively to that of the positive electrode when both are immersed in a liquid bath, such as a solution of potassium or sodium carbonate, the surface of such negative electrode, where immersed, glows with light, gas bubbles arise from it, and the electrode itself heats rapidly in spite of its immersion in cold liquid. A bar of iron used as the negative electrode, may thus be brought to incandescence and removed for welding, or it may even be melted under the liquid of the bath. The loss of heat in such a liquid heating process is necessarily somewhat great.

The Thomson process of electric welding, which differs radically from the arc heating operations above described, was first announced in 1886. It has since gone into extensive commercial use. No electric arc is employed, but the heat which effects the welding is solely due to the resistance of those parts of the metal pieces at the contact where they are to be welded together. This resistance is, of course, extremely low, and the delivery of sufficient energy for heating and welding is the result of the passage of relatively enormous currents. Their potential is only two or three volts, more or less. The metal pieces to be welded together are held respectively in massive clamps or vises of highly conducting metal such as copper, with a slight portion only of each piece projecting to form the joint. These projections of the pieces are brought together in firm contact, for which

purpose at least one of the clamps is made movable toward and from the other, both of them being mounted on a firm support. The pieces having been adjusted to meet in correct relation for the subsequent formation of the weld uniting them, an electric current sufficient in amount to heat the meeting portions of the pieces to the temperature at which they soften and unite, is passed from clamp to clamp, thus traversing the joint and the short projecting portions of the pieces between the clamps. So heavy is the current at command that a solid bar without break spanning the space between the clamps could be heated and melted. The completion of the weld after heating is effected by pressure exerted to force one clamp toward the other, which results in a slight upsetting or extrusion of metal at the weld called a burr. For copper a pressure of about 600 pounds per square inch of section is usual, while with iron it is 1,200 and with tool steel 1,800 pounds or more. Nearly all of the metals, even those like antimony and bismuth which are brittle and crystalline, may be united by this process, and many different metals and alloys joined one to another. In some cases, as with high carbon steels, a flux such as glass of borax, is employed to facilitate union at temperatures not high enough to burn or destroy the texture of the metal. Mild steel and iron welds are usually made, as in ordinary forges, at welding heat, or that which melts or fluxes the ordinary black oxide scale upon the metal. The heavy welding currents can not be conveyed without great loss to distances of even a few feet unless conductors of prohibitive section and cost be used. The welding clamps are in practice carried directly upon the secondary terminals of a special welding transformer. The Thomson welding transformer is a construction like a lighting transformer in which the usual secondary circuit of numerous turns is replaced by a very massive conductor constituting ordinarily only a single turn around the iron magnetic core. The primary or inducing circuit is similar to that of the ordinary transformer for alternating current and it is supplied from alternating current dynamos or lines as usual in such work. It will be seen that the secondary conductor is unique in character, being often a bar or casting of many square inches of section of copper of short length. The circuit of this single turn secondary is completed only by the meeting ends of the work pieces in the clamps. It will thus be evident that the chief resistance or opposition to the flow of the low voltage current in the single secondary turn will be at the proposed joint or weld between the clamps. Here it is then that the transformed energy is for the most part given out as heat, the section of metal which can be welded depending upon the scale of the apparatus used and the energy of the primary source which is available. The welding transformer has found convenient application in the heating of metal pieces for forging, bending, shaping, brazing or the like, in addition to welding. It has also in the Lemp process been divested of its welding clamps and applied to the local annealing of the hardened face of armor plates, so as to facilitate drilling and tapping, or cutting into desired shapes. The welds made by the Thomson process are usually butt welds, though lap welds are also made with almost equal facility. In butt welding there is of course an upset, burr, or

WELDON—WELDON AND SOUTH SIDE RAILROADS, RAID ON

extrusion of metal at the joint. In many cases this is not removed, and it renders the joint stronger than other adjacent sections. Oftentimes the joint is pressed or forged while still hot so as to remove the burr at the joint. In other cases the joint is finished by filing or grinding. The welding clamps are modified in form and disposition to suit the shape and size of the pieces to be held, and the pressure used to effect the weld is either manually applied by levers or is obtained from a strained spring, or again, in large work, by hydraulic means under control by suitable valves. The heating effects of the electric current are so perfectly adjusted by regulating appliances that most of the metals formerly regarded as unweldable, yield good results with the process. Even leaden pieces, such for example, as sections of lead pipe, may be joined together with great ease. The operation of the electric welder is characterized by uniformity, rapidity, flexibility, cleanliness, neatness, accuracy and economy. It has found extensive application to repetition work; single machines making sometimes as many as 2,000 welds per day of ten hours. It is used widely in the wagon and carriage industry for tires, axles, bands, fifth wheels, etc., and for wire bands for affixing rubber tires to wheels. Many parts of bicycles and automobiles are built up by electric welding. In the construction of tools and parts of machinery and particularly in the wire industry it plays an important part. Another important field is in the welding of wire or strip into hoops or bands for barrels, tubs, pails, etc. Machines are in operation producing electrically welded wire fencing, in which the wires which in the fence are horizontal are welded to verticals at intervals, the action somewhat resembling that of a loom. In joining pipe into continuous lengths or coils, and also in welding *in situ* street railway rails into a continuous track the electric weld possesses a special adaptability. An interesting application of the electric welder is found in the production of steel tubing by the progressive welding of a longitudinal seam. A long strip of flat sheet or *skelp* is rolled up so as to cause the lateral edges to meet. It then passes between welding rolls whereby the heating current locally traverses the meeting edges and welds them. The operation is progressive from one end of the pipe to the other as it is fed through the machine. The result is a pipe of uniform diameter with walls of even thickness, having a delicate bead along one side where the weld has been made. This bead is removed if the pipe be subsequently mandrel drawn with a reduction of its diameter. In the earlier electric welders the operations of clamping the pieces in place, applying and cutting off the electric current and exerting mechanical pressure, were usually manually controlled. Machines more or less automatic are now frequently employed. In recent types adapted for rapid repetition of work upon identical pieces, the action is entirely automatic; the machine runs continuously and its sequence of actions is definitely determined by its construction. These machines are power driven, movements being imparted for clamping the pieces as they are fed to the machine, for closing the current switch, for exerting pressure to complete the weld, for cutting off the current and for releasing the pieces from the clamps after the operation. In wire fence

and chain machines the stock is itself fed automatically and the welding continued until the machine is stopped or the material exhausted. The energy required to effect electric welds naturally varies with the size of the pieces and with the material. It also depends upon the time consumed in the work, which time may be made shorter or longer even with exactly similar pieces. The following table gives the results of some tests made upon different sections of iron, mild steel, brass and copper in the form of bars. The figures are only approximate and would vary considerably if the welds had been made in times different from those given. In general, working at a greater rapidity would lessen the total power used but require larger apparatus for the increased output required during the welding:

ENERGY USED IN ELECTRIC WELDING BY THE THOMSON PROCESS.

	Section, Sq. in.	Kilowatts in primary of welder	Time in seconds	Total kilo- watt sec- onds
Iron and Steel	0.5	8.5	33	280.5
	1.	16.7	45	751.5
	1.5	23.5	55	1292.5
	2.	29.	65	1885.
	2.5	34.	70	2380.
	3.	39.	78	3042.
	3.5	44.	85	3740.
	4.	50.	90	4500.
Brass ...	0.25	7.5	17	127.5
	.5	13.5	22	297.
	.75	19.	29	551.
	1.	25.	33	825.
	1.25	31.	38	1178.
	1.50	36.	42	1512.
	1.75	40.	45	1800.
	2.00	44.	48	2112.
Copper ...	.125	6.	8	48.
	.25	14.	11	154.
	.375	19.	13	247.
	.5	25.	16	400.
	.625	31.	18	558.
	.75	36.5	21	766.5
	.875	43.	22	946.
	1.00	49.	23	1127.

ELIHU THOMSON,
Electrical Expert and Inventor.

Weldon, N. C., a town in Halifax County, on the Roanoke River and the Seaboard Air Line and Atlantic Coast Line railways, 97 miles east of Raleigh. It is at the head of steamboat navigation on the Roanoke. Here are located six churches, a state bank, a winery, several mills, and a weekly newspaper. There is excellent water-power. The surrounding region is an agricultural one. Pop. (1890) 1,286; (1900) 1,433; (1910) 1,999.

Weldon and South Side Railroads, Wilson's Raid on. The first movement in the siege of Petersburg, June 1864, was to sever its railroad communication with the south and for this purpose Gen. Meade ordered Gen. J. H. Wilson to lead an expedition to destroy the roads, after which he was authorized to cross into North Carolina and make his way to the coast or to join Gen. Sherman in northern Georgia. When Wilson suggested a possibility that he might have to return northward, he was assured that the enemy's cavalry would be fully employed by Sheridan and that it was the intention for the Army of the Potomac immedi-

WELL--WELLAND CANAL

ately to cover the Weldon and South Side railroads, so that no infantry could be sent from Petersburg to bar his return. Wilson, at 3 o'clock on the morning of 22 June, moved from Mount Sinia church on the Blackwater to destroy the Petersburg and Lynchburg, and Richmond and Danville railroads, his objective point being Burkesville, the intersection of these roads. He had two brigades of his own division, and Gen. Kautz's division of four regiments, in all about 5,500 men with 16 guns. He crossed the Weldon Railroad at Reams' Station, destroying the station and some of the road, reached the Lynchburg road, near Ford's Station, about 14 miles from Petersburg, and destroyed it as far south as Burkesville, a distance of 30 miles, and then turned to and moved along the Danville road, destroying it to Staunton River, about 30 miles. The Confederate cavalry division of Gen. W. H. F. Lee had followed him closely, and near Nottoway Court House succeeded in interposing between his two divisions. At Staunton River Kautz found the bridge guarded by about 600 militia with artillery intrenched, which he attacked without success. At the same time W. H. F. Lee attacked Wilson's rear, and the latter, now nearly 100 miles from Petersburg, and having accomplished the object of his expedition and unable to go farther, determined to return. Marching at midnight, he moved eastward 80 miles, through Christianburg and Greensboro, crossing the Meherrin River, at Safford's bridge, and arriving at the Double Bridges of the Nottoway in the afternoon of the 26th. He was then ten miles west of Jarratt's Station of the Weldon Railroad. Ascertaining that but 1,000 Confederate cavalry and infantry held Stony Creek Depot, on the Weldon Railroad, ten miles northeast, he moved rapidly to cross the railroad two miles south of that point. Gen. Lee had been kept well informed of Wilson's movements and, to intercept his return, had sent Gen. Hampton, with his cavalry division, on the 27th to Stony Creek Depot, where he arrived at noon of the 28th. Fitzhugh Lee's division following as far as Reams' Station, ten miles north of Stony Creek and about the same distance south of Petersburg. When Wilson arrived at the crossing of the Stony Creek Depot and the Dinwiddie Court House roads, he was attacked by Hampton's outpost, the contest continuing until 7 p.m. Wilson now endeavored to evade Hampton by marching westward to the old stage road to Petersburg, thence entirely around him to reach the left of the Army of the Potomac. Kautz led the advance, but before Wilson could withdraw all of his own division, early in the morning of the 29th, he was attacked in flank and front by Hampton and driven back on the road to the Double Bridges, and his command much scattered. Hampton following two miles, then turning back to intercept him should he attempt to cross the Weldon Railroad at or near Reams' Station; but Wilson's main body had passed the stage road before Hampton reached it, who only struck Wilson's rear. Wilson reached Reams' Station at 9 a.m., where he found Kautz, who had preceded him two hours, and engaged Fitzhugh Lee's cavalry and some of Gen. Mahone's infantry intrenched. Wilson had expected to find the Weldon road held by the Army of the Potomac; and now, finding himself so nearly surrounded, he issued all his ammunition, de-

stroyed his wagons and caissons, and at noon began to move back by the Boynton road and Double Bridges to the south side of the Nottoway, intending, after crossing the river, to move eastward about 20 miles and then turn north again. But Fitzhugh Lee had moved his division past his left and two brigades of infantry, under Gen. Mahone, sent down the railroad from near Petersburg, attacked Wilson in front, Fitzhugh Lee attacked him in flank and rear, Kautz was cut off, and Wilson's whole rear was thrown into confusion. Kautz escaped, crossed the railroad near Reams' Station, and got within the lines of the Army of the Potomac, abandoning his artillery, and having 1,000 of Wilson's men with him, 500 of his own remaining with Wilson. At Stony Creek Wilson's rear was again attacked and thrown into some disorder; but pushing on, he crossed the Nottoway before midnight, and then moved eastward to Jarratt's Station, where he halted until daylight of the 30th, when he continued eastward, crossed the Nottoway again at Peter's bridge, rested five hours, and at 6.30 p.m. resumed the march for Blunt's bridge over the Blackwater. The bridge had been in great part destroyed, and the river was not fordable. A hard hour's work repaired the bridge, which was crossed and destroyed, just as Hampton and Fitzhugh Lee came up. The Confederates here ceased pursuit, and Wilson arrived at Light House Point, in the afternoon of 2 July. He had been gone ten days, had marched over 330 miles, and had destroyed more than 60 miles of railroad. His loss in both divisions was 240 killed and wounded, and 1,261 captured or missing; 12 field-guns and 4 mountain howitzers were abandoned; and all his wagons were burned or captured. Consult: 'Official Records,' Vol. XL; Humphreys, 'The Virginia Campaign of 1864-5.'

E. A. CARMAN.

Well, a natural flowing spring; excavations for water, which are among the most ancient permanent human constructions. The wells of the Sahara are square holes cut in the sand, beneath which, in most places, lies a continuous sheet of water at convenient distances for digging. The Greek and Roman wells were provided with a curb, long before well sweeps or pulleys were invented, as the deeply worn grooves in the curbs of ancient wells prove.

Welland Canal, Ontario, Canada, a ship canal extending from Port Colborne to Port Dalhousie, across the neck of land west of the Niagara River and Falls, and maintaining continuous navigation between Lake Erie and Lake Ontario. It traverses Welland County, and near Welland, the capital [pop. (1901) 1,863], the Welland or Chippewa River forms part of its course. The canal is 26½ miles long, 14 feet deep, and surmounts a rise of 362¾ feet by 25 locks. It was begun in 1824 and was opened to travel in 1833. It was enlarged in 1871, and again in 1900, the total amount expended on its construction to 30 June 1900 amounting to \$24,233,587. The canal is open to navigation on an average about 240 days in the year; an average of 2,200 vessels, transporting 700,000 tons of freight, pass through annually; and the annual collection of tolls on freight, passenger, and vessels averages about \$225,000. See CANALS.

WELLDON—WELLESLEY COLLEGE

Well'don, James Edward Cowell, English prelate and educator: b. Tonbridge, Kent, 25 April 1854. He was educated at Cambridge, was head master of Dulwich College 1883, and of Harrow School, 1885-98. In the last named year he was appointed to the bishopric of Calcutta and as such was metropolitan of India. He resigned in 1902 and returned to England, where he was made canon of Westminster. Besides standard translations of Aristotle's 'Politics,' 'Rhetoric,' and 'Nicomachean Ethics,' he has published: 'Sermons Preached to Harrow Boys' (1887); 'The Spiritual Life and Other Sermons' (1888); 'The Hope of Immortality' (1898); 'The Revelation of the Holy Spirit' (1902).

Welle-Makwa, wél'k-mák'wá, Central Africa, the most important affluent of the Ubangi (q.v.), a tributary of the Kongo. Its source is on the western slope of Mount Emin Pasha, and after a course of about 400 miles through a fertile and rich country to the north and east of the Kongo, it flows into the Ubangi at Dayu, opposite Yakoma, at the confluence of two other headstreams. The identity of the Welle-Makwa, was uncertain for many years; explorers thought it was a different stream to the Ubangi, but their connection was fully established in 1888, and the river throughout its entire length is sometimes called the Welle-Makwa.

Weller, Reginald Heber, American Protestant Episcopal bishop: b. Jefferson City, Mo., 6 Nov. 1857. He studied at the University of the South 1875-7, and was graduated from the Nashotah Theological Seminary, Wisconsin, in 1884. Ordained to the priesthood in the last named year he was rector of Eau Claire, Wis., 1884-8; of Waukesha, Wis., 1888-90; and of Stevens Point, Wis., 1890-1900. He was consecrated bishop-coadjutor of Fond du Lac in November 1900, the somewhat spectacular ceremonial practised on this occasion calling forth more or less criticism.

Welles, wélz, Oideon, American statesman: b. Glastonbury, Conn., 1 July 1802; d. Hartford, Conn., 11 Feb. 1878. He studied at Norwich University, Vt., but did not complete the course there, and for a time turned his attention to the study of law. In 1826, however, he entered journalism as editor of the *Hartford Times*, which under his management became one of the leading Democratic papers of the State. He was one of the first publicly to advocate Andrew Jackson's election to the presidency, and always warmly supported him. In 1827-35 he was a member of the Connecticut legislature, and both as legislator and editor advocated the abolition of imprisonment for debt, opposed the practice of special legislation, and succeeded in obtaining the passage of general laws for the incorporation of business corporations. In 1836 he resigned the editorship of the *Times*, but continued to write for that paper. In 1835, 1842, and 1843 he was chosen State comptroller; in 1836-41 he was postmaster of Hartford; and in 1846 was appointed chief of the bureau of provisions and clothing in the Navy Department, which office he held till 1849. He had always been opposed to the extension of slave territory, and on the organization of the Republican party in 1855, became identified with it, and was Republican

candidate for governor of Connecticut in 1856; and a member of the national committee. In 1861 he was appointed secretary of the navy, and conducted the affairs of his department with marked executive ability throughout the Civil War; he continued in office under President Johnson till 1869. He was later affiliated with the Liberal Republicans, and in 1876 was a supporter of Tilden. He wrote 'Lincoln and Seward' (1874).

Wellesley, wélz'li, Arthur. See **WELLINGTON, ARTHUR WELLESLEY, DUKE OF**.

Wellesley, Richard Colley, Viscount and MARQUIS, British statesman: b. Dublin 20 June 1760, d. London 26 Sept. 1842. He was educated at Oxford and on his majority took his seat as Earl of Mornington in the Irish House of Peers. Three years after he was returned to the British House of Commons as member for Beccalston and afterward sat for Windsor (1787-96), and for Old Sarum (1796-7). He was appointed governor-general of India in 1797, and in 1799 created Marquis Wellesley in the Irish peerage. His administration, both for its ability and the large accessions of territory made under it by the conquest of Mysor and the humbling of the Marhattas, and in 1809 became foreign secretary under Mr. Perceval. In 1812 he resigned his place chiefly because he was in favor of Catholic emancipation, and did not return to office till 1821, when he became lord-lieutenant of Ireland. This post he retained till 1825, when he was removed from it by his brother, the Duke of Wellington, who was an opponent of emancipation and had become prime minister. In the Grey ministry he held the office of lord-steward till 1833, when he again became lord-lieutenant of Ireland. Displaced in the following year by the Peel ministry, he afterward held the office of lord-chamberlain for a few months of 1835. Consult. Martin, 'Indian Despatches, Minutes, and Correspondence of the Marquis Wellesley' (1836-7), and biographies by Torrens (1880), Malleison (1889), and Hutton (1893).

Wellesley, Mass., town in Norfolk County: on the Boston & Albany Railroad, 14 miles west of Boston. It was incorporated as a town in 1881, and includes the villages of Wellesley, Wellesley Hills, and Wellesley Farms. It is principally a residential town, with many broad streets and handsome residences. It is the seat of Wellesley College (q.v.), and also of Dana Hall, a secondary school for girls; Wellesley School, and Rock Ridge Hall, secondary schools for boys; and two Roman Catholic academies, the Academy of the Assumption for girls, and Saint Joseph's Academy for boys. There is also a public high school at Wellesley Hills, founded in 1865, and a public library of about 12,000 volumes (1904). The government is vested in the town-meeting and the selectmen, chosen annually. The water-works are owned and operated by the town. Pop. (1910) 5,413.

Wellesley College, a college for women located at Wellesley, Mass. It was founded by Henry F. Durant to give "to young women opportunities for education equivalent to those usually provided in colleges for young men." The charter was obtained in 1870, and the college first opened to students in 1875. It is non-sectarian in control; three representatives

WELLESLEY ISLANDS — WELLINGTON

of the alumnae serve on the board of trustees. In 1888-94 the system of elective courses was established which is still in force. The college confers one baccalaureate degree, A.B., and the graduate degree, A.M. Certain courses are required in mathematics, philosophy, physiology, Bible history, English, some foreign language, and natural sciences; in addition to the required studies every candidate for the degree must take a sufficient amount of elective work to complete the equivalent of 57 one-hour courses, a one-hour course being a course given once a week for one year; before 1905 the requirement was 59 one-hour courses. Of these electives 18 one-hour courses must be taken in one of the following ways: 9 in each of two subjects, related or unrelated; 9 in one subject with 9 divided between two tributary subjects; 12 in one subject with 6 in a tributary subject; 12 in one subject with 6 divided between two tributary subjects. Pedagogical courses are offered in the history and science of education and in methods of teaching; art and music are included in the curriculum; the courses in history and theory in both departments count toward the degree; studio work in art counts toward the degree after one course in history is completed; the regular practical work in music does not count toward a degree. A full course in music leading to the certificate of the department may be taken by candidates for the A.B. degree who remain at the college five years. The college contributes toward the support of the American School of Classical Studies in Athens, the American School of Classical Studies in Rome, the Marine Biological Laboratory at Wood's Holl, and the women's table at the Zoological Station at Naples. There are 44 scholarships for undergraduates and one graduate fellowship. The students maintain literary and dramatic societies and a number of the Greek letter societies. The campus has a particularly beautiful situation within the limits of the town; it includes a lake which affords excellent opportunity for rowing and skating; on this lake is held the annual "Float." The buildings include College Hall, the Farnsworth Art Building, the observatory, Houghton Memorial Chapel, and the residence halls or "cottages" for students. In 1903 an addition to the endowment of \$150,000 was raised to offset the gift from John D. Rockefeller of a central heating plant; the productive funds amount to \$836,342 (in 1904). The library contains 67,000 volumes, including the Gertrude Memorial Library, the Library of American Linguistics, and other special and departmental libraries. The students in 1910 numbered 1,375 and the faculty 125; about 42 per cent of the graduates have become teachers.

Wellesley Islands, Australia, in the Gulf of Carpentaria, are politically attached to Queensland. Mornington, the northernmost and largest island, is 40 miles long by 15 miles broad.

Wellhausen, vèl'how-zèn, Julius, German Orientalist and Biblical scholar: b. Hameln, Hanover, 17 May 1844. He studied theology in the University of Göttingen, in 1872 was appointed professor of theology in Greifswald University, but resigned in 1882 because he could no longer hold the accepted views of Scriptural inspiration. He went to Halle as extraordinary

professor of Oriental languages, and in 1885 was appointed to an ordinary professorship at Marburg, whence in 1892 he removed to Göttingen to occupy a similar post. In 1871 he published a text-critical work on the books of Samuel, and in 1874 appeared his treatise 'Die Pharisäer und die Sadducäer.' The first volume of a 'Geschichte Israels' was issued in 1878, and a second edition of it in 1883, under the title 'Prolegomena zur Geschichte Israels' (5th ed., 1899). The 'Prolegomena' was translated into English in 1885 by Black and Menzies, with a preface by W. Robertson Smith, the volume containing also a reprint of his article 'Israel' contributed to the 'Encyclopædia Britannica' (9th edition). The last-mentioned article was published separately in 1881 as a 'Sketch of the History of Israel and Judah' (3d ed., 1891), and included in a German form, as an 'Abriss der Geschichte Israels und Judas,' in the 1st volume of his 'Skizzen und Vorarbeiten' (1884-92). More recently the 'Abriss' has been amplified to form a work on 'Israelitische und Jüdische Geschichte' (1894; 4th ed. 1901). His masterly treatise on 'Die Composition des Hexateuchs und der historischen Bücher des Alten Testaments' (1885; 3d ed. 1899) originally appeared in the 'Jahrbücher für deutsche Theologie' (1876-7). Later works are: 'Muhammad in Medina' (1882); 'Der arabische Jospus' (1897); 'Reste arabischen Heidentums' (2d ed. 1897), first published in the 'Skizzen und Vorarbeiten'; 'Die Kleinen Propheten übersetzt, mit Noten' (1892; 3d ed. 1898); 'Das Evangelium Marci' (1903).

Wellington, James Clarke, American educator: b. Trenton, N. J., 14 July 1825; d. Hartford, Conn., 4 Sept. 1894. He was graduated from Princeton in 1844, was appointed associate principal in the New York Collegiate School in 1848, and in 1856-65 was literary editor of the Washington 'National Intelligencer.' He was clerk of the United States court of claims in 1862-7, in 1867-70 was president of Saint John's College, Annapolis, Md.; occupied the chair of belles-lettres at Princeton in 1870-1; and in 1871-94 was president of Columbian University, Washington, D. C. He was a regent of the Smithsonian Institution, president of the Corcoran Gallery of Art, and also of the Philosophical and the Anthropological Societies of Washington.

Wellington, Arthur Wellesley, DUXE OF, British soldier and statesman: b. 1769; d. Walmer Castle, England, 14 Sept. 1852. He was the fourth son of the 1st Earl of Mornington. His mother was the eldest daughter of the 1st Viscount Dungannon. He was educated at Eton, privately at Brussels, and finally at the Military College of Angers. On 7 March 1787 he received a commission as ensign in the 73d Foot. He was gazetted under the name of Wesley, the family name till changed by his brother to Wellesley. After a rapid series of changes and promotions he attained by purchase in September 1793 the command as lieutenant-colonel of the 33d Regiment, in which he had attained his majority in April of the same year. In 1790 he was returned to the Irish Parliament for the family borough of Trim, in the country of Meath. In May 1794 he sailed with his regiment for Flanders to join the army of the Duke of York. In 1796 he joined his regiment at the

WELLINGTON

Cape, arrived at Calcutta in February 1797, and was attached to the Bengal service. Later the 33d Regiment was attached to the Nizam's contingent in the Deccan with Wellesley in command. The army entered Mysore in March 1799. An engagement took place at Mallavelly on the 27th, in which Wellesley, who commanded the left wing, turned the right of the enemy. He was subsequently employed to dislodge the enemy from their posts in front of Seringapatam, and after the capture of that capital was appointed, July 1799, to its command. During his administration he was compelled to take up arms against Dhundiah Waugh, a robber chief, who styled himself "King of the Two Worlds." Wellesley overtook and routed him with a small body of cavalry to Sept. 1800. In April 1800 Wellesley attained the rank of major-general. Early in 1803 he was appointed to the command of a force destined to restore the Peshwa of the Mahrattas, driven from his capital by Holkar. This operation successfully performed, the other Mahratta chiefs, Scindia and the Raja of Berar, showed hostile designs against the British, and Wellesley was appointed to the chief military and political command in the operations against them. After an active campaign, in which he took Ahmednagar and Arungabad, he encountered a powerful Mahratta army, assisted by French officers, at Assaye (23 September) and entirely defeated it. The parallel successes of General Lake, and the defeat of the Raja of Berar by Wellesley at Argaum on 29 November, compelled the submission of the Mahrattas, and peace was restored on conditions drawn up by the successful general. The fame of Wellesley's achievements had now spread over India. Before leaving Madras he received his appointment as K.C.B. and the thanks of both houses of Parliament. He sailed for England on 10 March 1805 and arrived in September.

On 10 April 1806 Wellesley married Lady Catherine Pakenham, third daughter of the Earl of Longford. He had previously been elected and distinguished himself in the House of Commons by the defense of his brother's administration in India. In April 1807 he was appointed chief secretary for Ireland, and in August received the command of the reserve in the expedition to Copenhagen under Lord Cathcart and Admiral Kioke. He took Kioke 29 April, the only land operation of importance. On returning he resumed his duties as secretary, and received the thanks of Parliament for his share in the expedition. On 25 April 1808 he attained the rank of lieutenant-general.

In June Wellesley received the command of a force destined to operate in the north of Spain and Portugal in aid of the revolt against Napoleon. On 30 July he anchored in Mondego Bay, and landed his troops at Figueira. The English began their southward march on 8 August. Wellesley moved on the coast road to Torres Vedras. At Roliça he encountered about 5,000 men under Delaborde, whom Junot had sent in advance to arrest his progress. This corps, after a spirited resistance, was driven back and retired to Torres Vedras. Wellesley now drew nearer the coast, reaching Vimeiro on the 19th, where he was reinforced by two brigades from England, raising his force to 17,000. At the same time he was superseded in the command. The government had determined

to increase their army in the Peninsula, and had appointed Sir Hew Dalrymple to the chief command, with Sir Harry Burrard as second, and Wellesley, Moore, Hope, Paget, and Fraser as divisional commanders. Junot determined to attack the English on the land side while they were in the immediate neighborhood of the sea. The attack was made on 21 August, and Junot was beaten. After the battle Junot proposed an armistice, the result of which was the famous Convention of Cintra, by which the French agreed to evacuate Portugal on condition of being conveyed to France with their arms and baggage. Public feeling in England over the excessive liberality of the terms ran so high that the generals were recalled to be examined by a board of inquiry, but their conduct was approved of and commended. Wellesley proceeded to Ireland in December as chief secretary, and early in 1809 received the thanks of both houses of Parliament for his conduct of the campaign.

In the latter part of 1808 Napoleon overran Spain with 200,000 men, and Sir John Moore, pursued by Soult, carried the British army to Coruña, where it embarked for England. Lisbon was still held by Sir John Cradock, and a British force occupied Cadiz, when Wellesley was appointed to assume the chief command in the Peninsula. He arrived at Lisbon 22 April 1809. He advanced against Soult at Oporto, and the French were thrown into confusion and retreated precipitately. Soult now retired to Galicia, followed by Wellesley to the frontiers of Portugal, and harassed by the insurgent Portuguese. The Peninsula was at this time occupied by about 250,000 French troops; but after the departure of Napoleon the independence or insubordination of the French marshals prevented effective co-operation of the different armies, and the French command never extended beyond the districts occupied by their armies. The British commander had a series of difficulties to contend with. First was the smallness of the armies on which he could rely. The numbers of the British were always comparatively insignificant, and reinforcements were slowly and scantily supplied. Almost as formidable was the difficulty of co-operating with his allies. Spain and Portugal were without regular governments. The Portuguese officers even had mostly fled to Brazil, but the Portuguese troops, carefully drilled by Beresford and placed under the command of British officers, soon became a tractable and efficient force. It was far otherwise with the Spaniards. The junta and the generals were alike ignorant, incompetent, and self-conceited, and with the raw levies which constituted the Spanish armies it was positively dangerous to co-operate. Even with the Portuguese government Wellington had natural but formidable difficulties to contend with. The subsistence of the armies was a constant source of danger and embarrassment both in Spain and Portugal. The resources of the country were oppressed by the armies of three nations. The French took all they wanted and wasted much more. The Spanish armies, numerous and inefficient, were a sufficient weight for the junta, which always supplied with reluctance the wants of the British, who had commonly much greater difficulty in procuring provisions for money than either of the other armies had in seizing them.

WELLINGTON

Through all these difficulties Wellington adhered with undeviating patience and constancy to the strict principles of discipline he had laid down. He remonstrated with herculean labor, and with admirable spirit, as his despatches show, with authorities of all kinds; but he never under the great temptation took, or suffered others to take, violent means to supply his most pressing wants.

By a misunderstanding between Soult, who held the command in the north of Spain, and Ney, who was under him, Galicia was evacuated by both marshals, and never afterward recovered, a valuable result of Wellesley's first campaign. To co-operate with the Spanish armies, Wellesley had determined to advance into Spain, which he did in July by the north of the Tagus. Nearly every important fortress in Spain was in the hands of the French.

The victory of Talavera, 27-28 July, earned Wellesley the titles of Baron Douro and Viscount Wellington. Next day the French retreated across the Alberche, and broke up their army. The first invasion of Spain had resulted in nothing but a series of movements among the French troops. Wellington at this time surveyed the lines of Torres Vedras, and formed his plan of fortifications for their defense. Anticipating that invasion would come from the north, he left General Hill to guard the Tagus, and fixed his headquarters at Viseu.

The French in the meantime were largely reinforced. Soult was in Andalusia with 60,000 men threatening the south of Portugal, while in the north the army of Portugal was concentrating to the extent of 70,000 to 80,000, and the veteran Masséna was appointed to command it. Wellington was able to bring into the field from 50,000 to 60,000 British and Portuguese troops. The French invested the Spanish fortress of Ciudad Rodrigo early in June, and took it on 10 July. They then advanced to the Coa, from which the British retired. Almeida was captured on 27 August. Wellington fell back on the valley of the Mondego. In the middle of September Masséna began his march down the right bank of the river. At the Sierra de Busaco, a high ridge in front of Coimbra, Wellington made a stand and repulsed the French. After the battle Masséna turned Wellington's position, who retreated to Leiria, where he halted two days. On 8 October he entered his lines, just as the autumnal rains were beginning to fall. A powerful fleet and a flotilla of gunboats on the Tagus contributed to their defense. Masséna was wholly unprepared for his reception, and after some vain demonstrations he retired from their front. The Portuguese parties had cut off his communications with Spain, and sickness was rapidly diminishing his numbers. On 15 November he fell back to Santarém. Napoleon recommended to waste the English with continual engagements of advanced guards, and sent Soult instructions to co-operate with Masséna. But Soult, with the blockade of Cadiz and with the Spaniards on his hands, could only spare a sufficient force to besiege Badajoz. In March 1811 Masséna was compelled to begin his retreat, which he conducted with great skill. The French crossed the Agueda on 6 April. Wellington estimated their loss in the campaign at not less than 45,000. Wellington blockaded Almeida, and cantoning his army between the Coa and the Agueda, returned to Badajoz, which

had been taken by Soult and invested by Beresford. He was speedily recalled by an aggressive movement of Masséna to relieve Almeida. Wellington took up a position to cover the fortress at Fuentes de Onoro, where he was attacked by Masséna with a superior force. In this battle he performed the exceedingly critical operation of changing his front in presence of the enemy. The maneuver was successful, and Masséna was repulsed. Almeida surrendered a few days after the battle, and Masséna was about the same time superseded by Marmont. Soult in the meantime had been defeated by Beresford at Albuera in an attempt to relieve Badajoz. Wellington returned to prosecute the siege, and Marmont also moved south to join Soult, but afterward returned to Salamanca. This induced Wellington to push the siege of Ciudad Rodrigo in preference to that of Badajoz, and he returned to the Agueda. Marmont, however, advanced with a superior force, and he withdrew to the Coa. Marmont returned to Salamanca.

During the winter Wellington continued to occupy himself with preparations for this siege, collecting his stores at Almeida under pretext of repairing it. On 6 Jan. 1812, he moved his headquarters to Gallegos, invested Ciudad Rodrigo on the 8th, and took it by assault on the 12th. An earldom, a pension, and a Spanish dukedom rewarded this achievement. Wellington now went south with his principal force to take Badajoz, and Marmont, who had collected his forces to raise the siege of Ciudad Rodrigo, invaded Portugal by Sabugal, and ravaged the country. Badajoz was taken on 6 April, with a heavy loss. Having secured the frontier fortresses Wellington determined again to invade Spain. Leaving Hill on the southern frontier he moved north with his main army, and on 17 June reached Salamanca, Marmont retiring to Toro. The French general, when he had concentrated his forces, attempted by a series of pretentious maneuvers to surprise the British commander, his ultimate object being to cut him off from his communications. With this purpose he crossed the Tormes followed by Wellington, who took up his position between the river and two hills called the Arapiles. Here Marmont's overdisplay of tactics recoiled on himself. Having gained the outer Arapile, in extending his left to attack the British right he gave Wellington the opportunity he had long desired of attacking him. Marmont was wounded, and the French left and centre broken. Clausel, who attempted to re-form the army, was routed. Numerous prisoners were taken by the cavalry in pursuit, and the French retired to Burgos. Wellington reached Valladolid on 31 July, and turning on Joseph, who had advanced to support Marmont, followed him to Madrid, which he entered on 12 August. Hill was now advancing to join Wellington, and Joseph fell back from Toledo to Almansa in Murcia. These successes compelled Soult to abandon Andalusia, and an Anglo-Spanish force from Cadiz took Seville. Wellington's next movement was against the army he had defeated under Clausel, which had been largely reinforced. He left Hill in Madrid (1 September), and advanced to Burgos, being joined on his way by a body of Spaniards. The French retired, leaving a garrison in the castle, which Wellington deemed it necessary to take before advancing. The siege, for want of proper artillery, occupied him till 21 October. In the

WELLINGTON

meantime the northern army under Souham was again advancing, and Soult with a powerful army marching on Madrid, which Hill had abandoned to fall back on Salamanca. Wellington abandoned the siege and retreated, closely followed by the French, who repeatedly attacked his rear. At Palencia he was joined by a brigade from England. At Tudela Souham halted to wait for Soult, and Wellington proceeded to the Tormes, where he was joined by Hill, and when the French crossed the Tormes in force he took up his old position at the Arapiles. The united armies of Soult and Souham amounted to nearly 90,000 men. Wellington's strength was over 50,000. The enemy, instead of attacking, threatened his communications, upon which he retreated to the Agueda, and established his headquarters at Ciudad Rodrigo. The French, not being prepared to invade Portugal, withdrew their armies to cantonments in Castile. General Hill's corps continued to occupy Estremadura, and the rest of the British were cantoned on the Portuguese frontier.

The gains of this campaign were substantial. The French had not only been compelled to reinforce their Spanish armies largely at the expense of their operations elsewhere, but had lost Andalusia, and given the British a footing in Estremadura. Wellington received (18 August) the title of marquis, and Parliament voted him thanks and £100,000. The failure of the Russian campaign compelled Napoleon to recall Soult from Spain, and Wellington was able to open the campaign of 1813 with a force of 70,000 British and Portuguese. He had also been appointed commander-in-chief of the Spanish armies. He opened the campaign in May by an advance in the former direction, and on 12 June reached Burgos, the French retreating to the Ebro. Wellington turned their position by crossing the Ebro near its source, and after some unsuccessful fighting they fell back on Vittoria. In a strong position commanding the principal roads through the town they were defeated by the British on 21 June. Being driven from the town, while the British left had seized the Bayonne road, by which they retreated, they were thrown into confusion and routed. Wellington now occupied the passes of the Pyrenees, and besieged Pampeluna and San Sebastian. He was created field-marshal and received the Spanish title of Duke of Vittoria. Soult was despatched by Napoleon, with the title of lieutenant of the emperor, to restore matters in the Peninsula. He had still a powerful army (80,000), but after a series of engagements, called the battles of the Pyrenees, he retreated into France. Some time being spent in pushing the sieges of Pampeluna and San Sebastian, the former of which surrendered 31 August, the latter 31 October, Wellington crossed the Bidassoa in October, and in November the whole army descended from the Pyrenees into the French plains. Some severe fighting occurred before the armies went into winter cantonments. On 27 February Wellington defeated Soult at Orthez, and the French retreated to Toulouse. Suchet had abandoned Catalonia, and reached Narbonne. Another engagement took place in front of Toulouse on 20 April, in which the French after severe fighting were driven into the town. Next day Soult evacuated Toulouse, and Wellington entered it on the 12th. In the afternoon news arrived of Napoleon's abdication, but Soult declined to sub-

mit to the provisional government without further advice, and Wellington refused an armistice. Advances having arrived from Berthier, Soult entered into a convention on 18, and Suchet on 19 April. In a sortie of the garrison of Bayonne, before the peace was known, the British suffered severely. On 30 April Wellington, leaving his army in quarters, set out for Paris. In May he had to visit Madrid to allay political differences among the Spanish generals, and on 14 June he issued farewell orders to his army. He was created Marquis of Douro and Duke of Wellington in May, with an annuity of £13,000, commutable for £300,000, afterward £400,000. He received the thanks of both houses of Parliament. In July he went as ambassador to France, and he succeeded Lord Castlereagh as British representative in the Congress of Vienna. In April he took the command of the army assembled in the Netherlands to oppose Napoleon. (See FRANCE; NAPOLEON I.; WATERLOO.) On his return to England after the restoration of peace he received a vote of £200,000 for the purchase of the estate of Strathfieldsaye, to be held on presenting a colored flag at Windsor on 18 June each year. Numerous foreign honors were showered upon him; among others he was made field-marshal of the armies of France, Russia, Austria, and Prussia.

With the return of peace he resumed the career of politics. He accepted the post of master-general of the ordnance with a seat in the cabinet of Lord Liverpool in January 1819. In 1822 he represented Great Britain in the Congress of Vienna. In 1826 he was appointed high-constable of the Tower, and went to Saint Petersburg as ambassador on the affairs of Greece. On 22 Jan. 1827 he succeeded the Duke of York as commander-in-chief of the forces. On the accession of Canning to office (April 1828) he set the bad example of resigning this post on political grounds. He resumed it again on the accession of Lord Goderich. On 8 Jan. 1828 he accepted the premiership and, resigning the command of the forces, gave it to Lord Hill. During his first year of office he carried the repeal of the Test and Corporation Acts. In January 1829 he was appointed governor of Dover Castle and lord warden of the Cinque Ports. This year he carried the Catholic Emancipation Bill. Both this and the repeal of tests were reforms which he had steadfastly opposed, and which he yielded to necessity rather than conviction. He fought a duel in defense of his conduct on this bill with Lord Walsley on 21 March. In 1830 repeated motions for parliamentary reform were defeated, but the growing discontent throughout the country on this subject and a defeat in Parliament caused the resignation of the government in November. His opposition to reform made the duke so unpopular that he was assaulted by a mob on 18 June 1832, and his life endangered. He accepted the office of foreign secretary under Sir Robert Peel, 9 Dec. 1834, and retired with him, 8 April 1835. In the Peel ministry in 1841 he took a seat in the cabinet without office. On 10 Dec. 1842, on the death of Lord Hill, he resumed the command of the forces, which he held till his death. On the return of Peel to office in 1846 he supported him in carrying the repeal of the corn-laws, which up till then he had opposed. From this time his general policy in Parliament was to support the government of the day.

WELLINGTON—WELLS

Consult: 'Wellington's Despatches, 1779-1815,' edited by Colonel Gurwood (1834-9); 'Supplementary Despatches and Memoranda, 1794-1818,' edited by Wellington's son (1858-72); 'Civil and Political Despatches, 1819-32,' edited by Wellington's son (1869-80); 'Speeches in Parliament,' edited by Gurwood (1854); the 'Lives' by Brialmont (1856-7); Gleig (1858-60); Hamley (1860); Browne (1888), composed of extracts from the records; Hooper (1889); Maxwell (1890); and those of Wright and Yonge. Consult also: Griffiths, 'Wellington and Waterloo'; Napier, 'History of the Peninsular War'; Ropes, 'Campaign of Waterloo'; Oman, 'History of the Peninsular War' (1902); and Roberts, 'Rise of Wellington' (1895). See also INDIA; PENINSULAR WAR; SPAIN.

Wellington, Chile, an island off the west coast of Magallanes Territory, 138 miles long and 35 miles wide. Its northernmost extremity is Cape San Roman.

Wellington, Kan., city and county-seat of Sumner County; situated in the south central part of the State, near the southern boundary, on Slate Creek, and on the Atchison, T. & S. F., the Southern K., and the Chicago, R. I. & P. R.R.'s. It was first settled in 1871; and became a city of the third class in 1876, and a city of the second class in 1880. It is situated in an agricultural region and carries on an important export trade in grain and other agricultural products; it contains grain elevators, three flouring mills, plow works, and the shops of the Atchison, Topeka & Santa Fé Railroad. There are three banks with a combined capital of \$175,000. It is the seat of the Sumner County High School. The city government is vested in a mayor and a council of 10 members, half of whom are elected each year; the city owns the waterworks and the electric-light plant. Pop. (1910) 7,034. J. G. CAMPBELL, Editor of the 'Monitor-Press.'

Wellington, New Zealand, (1) The capital city of New Zealand, and also of the provincial district of Wellington, situated on Lambton Harbor, on the southwest of Port Nicholson, an inlet of Cook Strait, about 1,200 miles southeast of Sydney in Australia. Its fine harbor is the safest and most commodious in New Zealand. It receives most of the direct sea trade of New Zealand. The principal buildings and institutions are: Government House, a fine building in Italian style, said to be the largest wooden structure in the Southern Hemisphere; the houses of legislature, (the parliamentary library building was destroyed by fire to Dec. 1907); the government building; supreme court edifice; Anglican, Roman Catholic, Wesleyan, Primitive Methodist, Presbyterian, Congregational, and other churches; a free public library; Wellington College, a girls' high school, Saint Patrick's College (R. C.) a technical school, and other similar educational institutions; Victoria University College, affiliated to the University of New Zealand; a general hospital; a lunatic asylum; the Boys' Institute; and the botanical gardens. The city is lighted by electricity, and has a good water supply, and its streets are traversed by electric tramways. The chief industrial establishments are tanneries, candle and soap works, coffee-mills, boot factories, biscuit works, foundries, brick-works, saw-mills,

woolen-mills, breweries, and meat-preserving works. The town has a patent slip, and has been fortified. Unlike most New Zealand towns, this one is built of wood, owing to the volcanic nature of its site, where several earthquakes have already occurred. Its exports for 1908 were valued at £319,002; its imports, at £5,030,901. Pop. (est. 1909) 69,357, including suburbs. (2) A provincial district in the south of North Island, area about 11,000 square miles. Its coast is but little indented, the principal openings being Palliser Bay and Port Nicholson in the south. It is traversed throughout almost its whole length by a range of mountains, averaging about 4,000 feet in height. Parallel to this main range, and nearer the east coast, there is a series of lower ranges, and between these two chief mountain systems extends the broad Wairarapa Plain, merging northward into an undulating country. A considerable extent of fairly level country, increasing in breadth northward, is also found along the west coast. The district is well watered by several rivers and in the south are Lakes Wairarapa and Onoke. Wellington is well wooded, and timber is one of its chief exports. Much of the surface is admirably adapted for pastoral purposes, and there are now in the district over 4,000,000 sheep, in addition to large numbers of cattle and horses. Agriculture is also successfully carried on in several parts, the principal crops being oats, wheat, potatoes, and turnips. The number of cheese and butter factories is steadily increasing. Little mineral wealth has been found in the district of Wellington, but some gold has been worked. Exports for 1908 were valued at £2,924,727; imports, £5,300,329. The chief town is Wellington, the capital of the colony. Railways run from Wellington to Napier and New Plymouth.

Wellington, Ohio, village in Lorain County; on the Wheeling & L. E., and the Cleveland, C. C. & St. L. R.R.'s; about 35 miles southwest of Cleveland. It is the commercial centre of a farm and dairy section. It is noted for its large annual shipments of cheese. It has flour mills, lumber mills, a foundry, and in the vicinity are a number of butter and cheese factories. The two banks have a combined capital of \$75,000 and deposits amounting to \$520,000. Pop. (1910) 2,200.

Wellman, Walter, American journalist and explorer; b. Mentor, Ohio, 3 Nov. 1858. He obtained a secondary education in Michigan, in 1879, established the *Evening Post* of Cincinnati, and from 1884 was political and Washington correspondent of the *Chicago Herald* and *Record-Herald*. In 1892, after investigation of the subject, he located the landing place of Columbus in the New World on Watling Island (San Salvador) in the Bahamas, and built a monument on the spot as he had determined it. He led an expedition to the Arctic regions in 1894, reaching lat. 81°, northeast of Spitzbergen, and in 1898-9 a second expedition, reaching lat. 82° and discovering many islands. He wintered in Franz Josef Land and in the spring of 1899 made an unsuccessful dash for the pole. In May 1899 a party directed by E. B. Baldwin (q.v.), a member of the expedition, discovered Graham Bell Land.

Wells, Benjamin Willis, American journalist and author; b. Walpole, Cheshire County, N. H., 31 Jan. 1856. He was graduated from

WELLS

Harvard in 1877, studied also at Berlin, was a fellow of the Johns Hopkins University, in 1891-8 was professor of modern languages in the University of the South (Sewanee, Franklin County, Tenn.), and in 1898 became a member of the staff of 'The Churchman' (New York). His chief publications are 'Modern German Literature' (1895); 'Modern French Literature' (1897); and 'A Century of French Fiction' (1898), historical and critical studies. He also edited numerous German and French texts, contributed largely to periodicals, and edited (with W. P. Trent) 'Colonial Prose and Poetry' (1901), an anthology.

Wells, Carolyn, American humorous writer: b. Rahway, N. J. She took up literary work in 1895, and her many publications which are chiefly for juvenile readers, are: 'At the Sign of the Sphinx' (1896); 'The Story of Betty' (1899); 'Folly in Fairyland' (1901); 'Eight Girls and a Dog' (1902); 'The Pete and Polly Stories' (1902); etc.

Wells, Catherine Boott Gannett, American writer, daughter of E. S. Gannett (q.v.): b. England 1838. She was married in 1863 to S. Wells (d. 1903). She has been active in promoting educational advance and beside publishing Sunday School manuals has also published 'In the Clearings'; 'Miss Curtis,' a novel; 'About People,' a collection of essays; etc.

Wells, David Ames, American political economist: b. Springfield, Mass., 17 June 1828; d. Norwich, Conn., 5 Nov. 1898. He was graduated from Williams College in 1847, and from the Lawrence Scientific School in 1851, but before entering the latter institution had been assistant editor of the *Springfield Republican*, and was one of the promoters of the invention of a mechanism for folding books and newspapers in connection with the printing press. In 1851 he was appointed assistant professor at the Lawrence Scientific School, and was also lecturer on chemistry and physics at Groton Academy; during this earlier period of his life he published several text-books on the natural sciences. He first attained reputation as a political economist by an address on 'Our Burden and Our Strength,' read before a literary society of Troy in 1864; it discussed the resources of the United States in regard to the nation's debt-paying ability, and attracted the attention of the President, who summoned him to a conference in regard to the national finances. This resulted in the creation of a commission of three for the investigation of questions of taxation and revenue, of which commission Wells was chairman. In this capacity he was the first to collect economic and financial statistics for government use. In 1866 he was appointed to the office of special commissioner of revenue, was instrumental in abolishing the many petty taxes which had been imposed during the war, and originated most of the important forms and methods of internal revenue taxation adopted from 1866 to 1870. In the latter year the office which he held was abolished. He had at first been an advocate of the protectionist policy, but after a visit to Europe and a careful study of the English system, he changed his views, and advocated the system of free trade. In 1876 he was an unsuccessful candidate for Congress on the Democratic ticket. He published: 'Our Burden and Our Strength' (1864); 'The Creed

of the Free Trader' (1875); 'Why We Trade and How We Trade' (1878); 'The Silver Question, or the Dollar of the Fathers vs. the Dollar of the Sons' (1878); 'Our Merchant Marine; How it Rose, Increased, became Great, Declined, and Decayed' (1882); 'A Primer of Tariff Reform' (1884); 'Practical Economics' (1885); 'Relation of Tariff to Wages' (1888); 'Recent Economic Changes' (1898). His writings are notable for their clear and forcible presentation of a vast number of details and statistics.

Wells, Heber Manning, American politician: b. Salt Lake City 11 Aug. 1859. He was graduated from the University of Utah in 1875, and began early to take an active part in public life. He was recorder of Salt Lake City in 1888-90, and a member of the city board of public works in 1890 and in 1893. He was a member of the Constitutional Convention which framed the Constitution under which Utah was admitted as a State; in 1895 was elected governor of Utah for a five years' term on the Republican ticket, and in 1900 was re-elected for a four years' term. During the prolonged struggle between the mine owners and miners' unions in 1904, he maintained an impartial attitude as far as possible, but firmly opposed anarchy and disorder.

Wells, Herbert George, English author: b. Bromley, Kent, 21 Sept. 1866. He was educated at the Royal College of Science (South Kensington, London), published a 'Text-Book on Biology' (1892-3), and followed this by a series of works of fiction in which science and mechanics are employed for the accomplishment of various wonders narrated in the circumstantial and plausible manner of Verne. Among them are: 'The Time Machine' (1895); 'Select Conversations with an Uncle' (1895); 'The Wonderful Visit' (1895); 'The Island of Dr. Moreau' (1896); 'The Wheels of Chance' (1896); 'Thirty Strange Stories' (1897); 'The Invisible Man' (1897); 'The War of the Worlds' (1898); 'Tales of Space and Time' (1899); 'When the Sleeper Wakes' (1899); 'Love and Mr. Lewisham' (1900); 'Anticipations' (1901); 'The First Men in the Moon' (1901); 'Mankind in the Making' (1903); and 'Twelve Stories and a Dream' (1903). From 1894 to 1896 he was a member of the 'Saturday Review' staff.

Wells, Horace, American dentist: b. Hartford, Vt., 21 Jan. 1815; d. New York 24 Jan. 1848. He studied dentistry in Boston, and practised it there until 1836, then went to Hartford, Conn. For years he made investigations and experiments in search of an agent for preventing pain in the extraction of teeth, and finally became convinced that he had found such an agent in nitrous-oxide gas. In 1844 he made a practical test by having one of his own teeth extracted while he was under the influence of his supposed anæsthetic, and the operation confirmed his belief in the discovery. Thenceforth he used nitrous-oxide gas in his practice. He published 'A History of the Application of Nitrous Oxide Gas, Ether, and Other Vapors to Surgical Operations' (1847). His claims to the discovery of anæsthesia were controverted in the interest of G. Q. Colton, C. T. Jackson, W. T. G. Morton, and J. C. Warren (qq.v.), to each of whom some of the honors of its introduction

WELLS—WELLSVILLE

belong. Wells may have had a predecessor in C. W. Long (q.v.), but with regard to the first surgical use of an anæsthetic, all other names must yield priority to his. He became mentally unbalanced while advocating his claims in New York, was taken into custody, and committed suicide. A statue of Wells stands in Bushnell Park, Hartford, Conn. See **ANÆSTHETICS**.

Wells, Kate Gannett. See **WELLS, CATHERINE BOOTH GANNETT**.

Wells, Lemuel Henry, American Protestant Episcopal bishop: b. Yonkers, N. Y., 3 Dec. 1841. He was graduated from Hobart College in 1867, having during the Civil War served as a lieutenant in a Wisconsin regiment, and after being graduated from Berkeley Divinity School, Middletown, Conn., took priest's orders in the Episcopal Church in 1871. He was rector of Walla Walla, Wash., 1871-82; of Saint Louis, Tacoma, 1884-9; and of Trinity, Tacoma, 1889-92. In 1892 he was consecrated missionary bishop of Spokane.

Wells, Rolla, American capitalist and politician: b. Saint Louis, Mo., 1856. He entered business in the employ of a street railway company, and became assistant superintendent and finally general manager of the company. Giving up the latter position in 1883, he became prominently identified with a number of manufacturing and commercial corporations, and he is recognized as one of the leading business men of his native city. He has been active in local politics as a Democrat; was a delegate to the Democratic National Convention in 1896, and was elected mayor of Saint Louis in 1901 for a four years' term. Though nominated on the Democratic ticket, he received a large number of independent votes. His administration has been efficient and economical and he has taken an effective part in the preparation for the Saint Louis Exposition of 1904.

Wells, Webster, American mathematician: b. Boston, Mass., 4 Sept. 1851. He was graduated from the Massachusetts Institute of Technology in 1873, pursued special studies in civil engineering, and from 1873 was engaged in teaching at the Institute, attaining full professorship in 1893. He has written a series of mathematical text-books, among which are: 'Logarithms' (1878); 'Plane and Spherical Trigonometry' (1884); 'Higher Algebra' (1889); 'Complete Trigonometry' (1900); etc.

Wells College, a college for women, located in Aurora, N. Y. It was founded in 1868 by Henry Wells, who at that time deeded to the trustees the main building and 20 acres of land. It is undenominational in its control and policy. In 1888 the main building was destroyed by fire, but immediately rebuilt without crippling the work of the college. A preparatory course was at first maintained, but was abolished in 1896, when the range of elective system was also greatly increased. The college has now given up taking special students, as the regular applicants exceed the number that can be accommodated. Formerly the three degrees of A.B., B.L. and B.S. were conferred, but the A.B. degree is now granted for the completion of the course, which is largely elective, especially in the last two years. Biblical literature is among the required studies, courses in

the theory and history of music count toward the degree, but technical musical work does not. The discipline is by a system of student self government, based on a series of simple rules adopted and enforced by the students themselves. The college is situated on Cayuga Lake, and the College Boat Club has erected a boat house for the use of their members. The college buildings include the main hall, Morgan Hall, a dormitory (the former residence of the founder), a gymnasium, a science hall, and the administration building. The students in 1910 numbered 188, the faculty 28. Wells seeks to maintain its distinctive character as a small college, maintaining a high standard of college work, but not attempting university methods.

Wellboro, wélz'búr-ō, Pa., borough, county-seat of Tioga County; on the Fall Brook Railroad (N. Y. C. & H. R.); about 80 miles north of Williamsport. It is in an agricultural and coal mining region. It has wagon and carriage factories, marble works, lumber mills, tanneries, and machine shops. There are two banks, the combined capital of which is \$150,000. Pop. (1910) 3,183.

Wellsburg, W. Va., city, county-seat of Brooke County; on the Ohio River, and on the Pittsburg, Cincinnati, Chicago & Saint Louis Railroad; about 15 miles north of Wheeling. It is in an agricultural and sheep-raising region, and in the vicinity are numerous coal mines and natural gas. It has a fine city-hall, paper mills, glass factories, a sack factory, grist mill, and machine shop. There are three banks, having a combined capital of \$230,000. The place was founded in 1790. Pop. (1890) 2,235; (1900) 2,588; (1910) 2,680.

Wellston, wélz'tón, Ohio, city in Jackson County; on the Cincinnati H. & D., the Ohio S., and the Baltimore & O. S. W. R.R.'s; about 72 miles in direct line southeast of Columbus. It is in an agricultural and coal mining region, and has considerable iron manufacturing. In 1900 (government census) the city had 41 manufacturing establishments capitalized for \$855,606. The cost of the raw material used annually was \$505,415 and the value of the annual products was \$1,056,110. The chief industrial establishments are foundries, blast furnaces, barrel factory, machine shops, cement works, and brick works. The city has a high school, public graded schools, and a public library. There are two banks with a combined capital of \$85,000 and deposits amounting to about \$800,000. The city owns and operates the electric-light plant and the water-works. The government is vested in a mayor who holds office two years and a city council. The place was settled in 1871 and in 1876 was incorporated. Pop. (1890) 4,377; (1900) 8,045; (1910) 6,875.

Wellsville, N. Y., village in Allegany County; on the Genesee River, and on the Erie and the Buffalo & S. R.R.'s; about 25 miles southwest of Hornellsville. It is in an agricultural and dairy region, and in the vicinity are a number of oil wells. It has foundries, machine shops, creameries, flour mill, tanneries, and cigar factories. There are two national banks with a combined capital of \$150,000. It has a high school, graded elementary schools, and a public library. Pop. (1890) 3,435; (1900) 3,556; (1910) 4,382.

Wellsville, Ohio, city in Columbiana County; on the Ohio River, and on the Pennsylvania Railroad; about 85 miles southwest of Cleveland. It is in an agricultural and coal mining region, and in the vicinity are valuable deposits of fire clay. The chief manufacturing establishments are machine shops, foundries, iron and steel works, brick and tile works, potteries, nail factory, boiler works, and railroad shops. In 1900 (government census) there were 61 manufacturing establishments which were capitalized for \$1,233,863, and whose annual finished products brought \$1,548,190. There are three banks; the two national banks have a combined capital of \$150,000. There are nine churches, a high school, public and parish schools, and a public library. The city owns and operates the water-works. Pop. (1910) 7,769.

Welsbach (wēlz'bān) Light, an invention of Carl Auer von Welsbach, an Austrian, in 1884. In Europe it is known as the Auer light. It is based upon the discovery that certain materials become incandescent at a low temperature. The process followed is to saturate a combustible filament in the form of a network with a solution of a salt of a refractory earth, such as zirconium. It is then dried out and burned, the combustible element disappearing and leaving a frame of refractory material, which becomes incandescent at a low temperature. See RAILWAY TRAIN LIGHTING.

Welsh, Herbert, American reformer: b. Philadelphia, Pa., 4 Dec. 1851. He was graduated from the University of Pennsylvania in 1871; studied art in Philadelphia and in Paris with Bonnat; and practised as an artist in Philadelphia for several years. Visiting the Sioux reservation, impressed with the belief that the Indians required only a just and consistent treatment by the government and the extension of Christian missions to become civilized, he began a movement to secure to them their rights, which resulted in the organization of the Indian Rights Association in 1882. He became corresponding secretary of this association and has been active in its work, which has been instrumental in securing the passage of a bill providing for the individual ownership of land, and the application of the civil service law to the Indian service. He also took a leading part in the reform movement in Pennsylvania State politics in 1890; and in 1895 established a weekly periodical 'City and State,' published in the interests of good government. He has strongly opposed the tendency toward imperialism, and has severely criticised the government's policy and the evils attending the army's occupation of the Philippines. He has written 'Four Weeks among some of the Sioux Tribes'; 'Civilization among the Sioux Indians'; 'A Visit to the Navajo, Pueblo, and Hualapai Indians'; 'The Other Man's Country' (1900), dealing with the Philippine question.

Welsh, John, American merchant: b. Philadelphia 9 Nov. 1805; d. there 10 April 1886. He was educated in his native city, where he became prominent in business and was active in public affairs in many capacities, having large railroad and financial interests. He was a member of the Sinking Fund Commission, president of the Philadelphia Board of Trade, etc., and rendered efficient service in promoting relief

measures during the Civil War, especially in connection with the Philadelphia Sanitary Fair, in 1864, of which he was president, and which raised over \$1,000,000 for army hospital work. In 1873 he became president of the Board of Finance of the Centennial Exhibition, receiving from the citizens of Philadelphia, at its close, a gold medal, and the sum of \$50,000, with which he endowed the John Welsh chair of English literature in the University of Pennsylvania. In 1878 he went as minister to England, but in the following year resigned.

Welsh Calvinistic Methodists, a designation sometimes given to the Calvinistic Methodists, because Wales is the great seat of the sect. The Calvinistic Methodists are distinguished by their Calvinistic sentiments from the ordinary Wesleyans, who are Arminian. Whitfield is regarded as the father and founder of Calvinistic Methodism. Members of this sect have been active in recent years in seeking to bring about the disestablishment of the Anglican Church in Wales. See METHODISM.

Welsh Language and Literature. See CELTIC LANGUAGES.

Welwitschia, wēl-wich'ī-ā, a genus of plants of the order *Gnetaceae*, containing only one species, *W. mirabilis*. This species is confined to the deserts of Southwest Africa, where it was discovered in 1860 by Friedrich Welwitsch. It has a short and top-shaped stem which never grows much above the surface, but increases in thickness, until it may be three feet in diameter, and bears a pair of large opposite leaves. These leaves last throughout the whole lifetime of the plant, and become ultimately torn up longitudinally into long strips, which trail on the surface of the ground. Two cotyledons which are like short-lived leaves of much smaller size precede them. The flowers of the plant grow in cones like those of many conifers, the cones being arranged in panicles on the end of the stem between the two leaves. The female cones are much larger than the male ones, and in fruit are of a scarlet color.

Wen, an encysted tumor, moderate, but considerably varying in size, occurring in different parts of the body; commonly situated immediately under the skin, but most frequently on the scalp. The causes of their formation are unknown, but a strongly marked tendency to such swellings exists in particular individuals, leading to the belief in constitutional causes. At its commencement the wen is always exceedingly small and perfectly indolent, and it is often many years before it attains any considerable size. It is enclosed in a sac, its contents being sometimes sebaceous matter, in other cases serum, or a thin fetid brown or black fluid. Sometimes the sac contains cartilaginous or even osseous matter. Frequently the sac, especially when small, may be punctured, and its contents pressed out; but sometimes this gives rise to very severe inflammatory action. Another and safe mode of treatment is to dissect them out with the knife wherever their position will admit of it, care being taken to remove the whole of the cyst.

Wen-chow, wān' chow', China, a treaty port in the province of Che-kiang, on the estuary of the Ta-kai river, flowing into the China Sea; about 200 miles south by west of Shanghai.

Ruined palaces, gates, and triumphal arches are among the numerous signs of its vanished greatness, but it is still a comparatively clean town, with broad streets. Among buildings of recent erection are the custom-house and the branch of the Imperial Chinese Postoffice. The chief imports are cottons, kerosene, sugar, opium, iron, and woolens; the principal exports are tea, umbrellas, timber, and oranges. The average annual values of the imports and exports during several recent years were about \$850,000 and \$200,000 respectively. The tonnage of shipping is about 27,000 per annum. There is also a considerable junk trade. Pop. about 80,000.

Wenatchi. See SALISHIAN INDIANS.

Wenceslas, wén'st-s-lās or -lās, or **Wenzel**, Emperor of Germany and King of Bohemia: b. 1361; d. Schlagfluss 16 Aug. 1419. He was the son of Charles IV. (q.v.), whom he succeeded in 1378. In 1394 the Bohemian nobility formed a conspiracy against him and held him prisoner at Prague, but later released him. Through the influence of the archbishop of Mainz, whose enmity he had aroused by demanding the resignation of the rival Popes, Benedict XIII. and Boniface IX., he was deposed by the Imperial electors, while the Elector Palatine Rupert was chosen to succeed him. In Bohemia he supported John Huss (q.v.) and the latter's party, and in 1409 compelled by a decree the departure of the Germans from the University of Prague. Shortly afterward he resigned the royal title. Consult Lindner, 'Geschichte des Deutschen Reiches unter König Wenzel' (1875-80).

Wend Language. The language of the Wends is similar to the other branches of the northwestern stem of the Slavic languages, the Polish and the Bohemian. It is divided into the dialect of Lower Lusatia, which is but little developed, and that of Upper Lusatia. The latter is subdivided into the Evangelical dialect, near Bautzen; the Catholic dialect, near Kamenz and in the northwest; and the northeastern dialect. The differences are mostly confined to shades of pronunciation. The stock of words in the present language of the Wends is largely mixed with German elements. Orthography has always been in a very unsettled condition, and especially a subject of controversy between Catholics and Protestants; but in modern times attempts at reconciliation and improvement have met with approval on both sides. In their publications, the Wends have mostly made use of the German letters. There are eight vowels, *a, o, u, e, i*, all of which are pronounced as in German and Italian, *ö* (between *o* in *note* and *u* in *full*), *ê* (like long English *e*), and *y* (approaching the German *ü*). Of consonants there are 32: *j* (*y* consonant), *w* (*v*), *ŵ* (*v* soft), *b*, *ß* (soft), *p*, *f* (soft), *m*, *ñ* (soft), *n*, *ñ* (soft, Fr. *gn*), *l*, *ž* (like *v*), *r*, *ř* (soft), *s*, *š* (Fr. *j*), *z*, *ž* (*sh*), *d*, *ds*, *ds* (*dsh* soft), *ds*, *t*, *c* (*ts*), *č* (*tch* soft), *č* (*tch*), *ts*, *h*, *ch*, (*k*), *g* (hard), *k*. There is no article. The substantives are of three genders, masculine, feminine, and neuter. Substantives ending in a consonant are mostly masculine, those in *a* and *i* feminine, and those in *o* and *e* neuter. There are seven declensions, two for the masculine, three for the neuter, and two for the feminine. The language has a dual number.

There are seven cases, namely, nominative, accusative, genitive, dative, locative (to express the relation of *in*), instrumental (to express the relations of *by* and *with*), and vocative. The adjectives end in *y*, *i* (masculine), *a* (feminine), *o* and *e* (neuter). The comparative is formed by the termination *ij*, and in order to form the superlative the syllable *naj* is placed before the comparative. The personal pronouns are irregular; the others are declined like adjectives. The verb has six tenses, present, imperfect, perfect, pluperfect, future, and future perfect; five moods, indicative, subjunctive, optative, imperative, and infinitive, beside a gerund; and three participles, present and perfect active, and perfect passive. Till about the middle of the 19th century Wendish literature consisted almost wholly of ecclesiastical and religious works, and works relating to the needs of peasant life, but there has since been a revival of national feeling, accompanied by a more extended literature. There are grammars of the Wendish language by Lincus (Prague 1679), Matthäi (1721), Seiler (Bautzen 1830), and Jordan (Prague 1841).

Wendell, Barrett, American educator and author: b. Boston, Mass., 23 Aug. 1855. Graduated from Harvard in 1877, he studied also in the Harvard Law School, in 1880-8 was instructor in English at Harvard, in 1888-98 assistant professor, and in 1898 became professor. He was Clark lecturer at Trinity College, Cambridge, England, in 1902. Among his works are 'The Duchess Emilia' (1885); 'Rankell's Remains' (1897); 'English Composition' (1891); 'Cotton Mather' (1891); 'Stelligeri, and Other Essays Concerning America' (1893); 'William Shakespeare' (1894); 'A Literary History of America' (1900; in the 'Library of Literary History'), a scholarly work, though much criticised for its unjust attitude toward certain writers; and 'Raleigh in Guiana' (1902), an attempt at imitation of the Elizabethan drama. He also contributed the interesting chapter on 'The American Intellect,' to Vol. VII., 'The United States,' of the 'Cambridge Modern History.'

Wends, a former powerful Slavic tribe settled in Germany, now represented by the Slavic people of Upper and Lower Lusatia, who call themselves Serbs (*Serbo*), whence the name Sorbs, often applied to them by German authorities. In the earliest historical times the Sorbs occupied the country from the Saale to the Bober, and from the latitude of Berlin south to the Erzgebirge; but the Wends are now confined to a small territory (about 1,270 square miles) in the upper Spree valley, extending from south of Bautzen to north of Kottbus. The larger part of this Wendish region belongs to the Prussian provinces of Brandenburg and Silesia, the smaller southern part being included in the kingdom of Saxony (circle of Bautzen). The Wends are completely surrounded by Germans, and being thus cut off from contact with the other Slavs, they are becoming slowly Germanized. Their language, known as Sorbian, falls into two dialects, Upper and Lower Sorbian, which are spoken in the south and the north of the territory respectively. (See WEND LANGUAGE.) The total number of Wends is about 120,000, of whom about 50,000 live in Saxony and 70,000 in Prussia. About 12,000 are Roman Catholics, the remainder being chiefly Lutherans.

Wener, vā'nēr, or **Vener**, Sweden, the largest lake of the country, and after those of Ladoga and Onega the largest in Europe, situated centrally between the läns of Wernland, Dalsland, and Wester Götland. It is 147 feet above sea-level, and of irregular shape. Its greatest length, northeast to southwest, is about 100 miles; and its breadth may average about 30 miles, though in its lower part, where two peninsulas stretch far into it from opposite directions, it is not more than 15 miles. This distance is still further narrowed by a group of small islands, and hence the part of the lake above these peninsulas is sometimes considered as Wener proper, while the part below is called Lake Dalbo. The area covered by both is 2,242 square miles. By far the most important feeder is the Klar-elf, which pours in at its north end the accumulated water of a course of more than 250 miles. Its only proper outlet is at Wenersborg at its southwestern extremity, where its superfluous waters are received by the Göta-elf. In summer steamers and other vessels ply regularly upon the lake; in winter it is frozen for several months, and crossed by sledges. It abounds with fish, particularly trout. The Göta Canal connects Lake Wener with Lake Wetter, and the Dalsland Canal connects it with Fredrikshald in Norway.

Wenley, Robert Mark, American educator: b. Edinburgh, Scotland, July 1861. He was graduated from the University of Glasgow in 1884, and later studied in Edinburgh, and on the Continent. He was in charge of the philosophical department of Queen Margaret College, Glasgow, in 1888-95, and since 1896 has been at the head of that department in the University of Michigan. He has published: 'Socrates and Christ' (1889); 'University Extension Movement in Scotland' (1895); 'Contemporary Theology and Theism' (1897); 'Preparation for Christianity in the Ancient World' (1898); etc. He was an associate editor of the 'Dictionary of Philosophy.'

Wenlock Group, a British formation of the Upper Silurian geological series. It includes shales and limestones, and is below the Ludlow group, and above the Upper Llandovery group, these three comprising the Upper Silurian groups. The Wenlock formation is about 4,000 feet thick, and the fauna has been classed as consisting of 171 genera, and 530 species, but many supposed vegetable remains are almost certainly not such. See SILURIAN.

Wensleydale, wēnz'li-dāl, James Parks, Baron, English jurist: b. Highfield, near Liverpool, 22 March 1782; d. Ampthill Park, Bedfordshire, 25 Feb. 1868. Graduated from Trinity College, Cambridge, in 1803, he was called to the bar at the Inner Temple in 1813, went the northern circuit, and became known for his wide knowledge of common law. In 1828 he was made a justice of the court of king's bench, in 1834 was transferred to the court of the exchequer. Here he remained strongly influential until his resignation in 1856, when he entered the Lords as Baron Wensleydale of Walton (Lancaster). In Parliament he spoke rarely, and chiefly on legal questions. His judgments were highly ranked. Consult Foss, 'The Judges of England' (1848-64), or the abridgment of the same, 'Biographia Juridica' (1870); Manson, 'Builders of Our Law' (1895).

Wen'tistrap, a gastropod mollusk, allied to the turret shells and of the genus *Scalaria*, in which the shell is turreted, spiral, and ornamented with elevated rib-like processes, crossing the whorls lengthwise of the shell. In some species the spiral is closed; but in the "true" wentletraps the whorls are open, that is, separated. Of the former, some are found in northern seas, and the latter are all natives of warm seas. They are inhabitants of deep waters, but their shells are cast up in great numbers on sandy coasts. They are carnivorous in habits. The famous precious wentletrap, or royal staircase (*Scalaria pretiosa*), formerly brought prices ranging as high as \$250 when purchased for the conchologist's cabinet, but its value in the present day is small. Its shell is about two inches long, and twisted in a wide spiral form, and is generally pale-yellow with white ribs.

Wentworth, wēnt'wérth, Benning, English governor of New Hampshire: b. Portsmouth, N. H., 24 July 1696; d. there 14 Oct. 1770. He was graduated at Harvard in 1715, became a merchant at Portsmouth, which town he frequently represented in the provincial assembly, was appointed a king's councillor in 1734, and when in 1741 New Hampshire was made a distinct province he became its governor. He so continued until 1767, when he resigned. He was authorized by the crown to grant patents of unoccupied land, and in 1749 began making grants on the west side of the Connecticut River, in what is now southern Vermont. These grants were considered by the colonial government of New York as within its domain, and, as Governor Wentworth stoutly maintained for a time his authority, the collision so famous in the history of Vermont respecting the New Hampshire grants ensued. (See VERMONT, History.) Governor Wentworth exacted heavy fees for his grants of land, and thus accumulated a large property, and in all of them stipulated for the reservation of a lot for an Episcopal church. The town of Bennington, Vermont, was named in honor of him. After his resignation as governor he gave to Dartmouth College 500 acres of land, on which the college buildings were erected. For an account of his second marriage, consult Longfellow's poem 'Lady Wentworth.'

Wentworth, Charles Watson. See ROCKINGHAM, 2d MARQUIS OF.

Wentworth, George Albert, American mathematician: b. Wakefield, N. H., 31 July 1835; d. Dover, N. H., 24 May 1906. He was graduated from Harvard in 1858 and in 1858-91 was professor of mathematics at Phillips Exeter Academy. With G. A. Hill he prepared a series of text-books on algebra, arithmetic, geometry, and physics, and he was author of the Wentworth Series of mathematical works comprising about 40 volumes, among which are: 'Elements of Geometry' (1878); 'Surveying and Navigation' (1882); 'Higher Algebra' (1891); etc.

Wentworth, Sir John, English colonial governor of New Hampshire and afterward of Nova Scotia: b. Portsmouth, N. H., 9 Aug. 1737; d. Halifax, N. S., 8 April 1800. He was a nephew of Benning Wentworth (q.v.). He was graduated at Harvard in 1755, being a classmate of John Adams, became a merchant, and in 1765 was the agent of New Hampshire to present petitions in England. While there he was ap-

pointed to succeed Benning Wentworth as governor of New Hampshire. At the same time he was made "surveyor of the king's woods" for all North America. Having landed at Charleston, S. C., in March 1767, he traveled through the colonies, registering in each his commission as surveyor, and arrived at Portsmouth in June. The office of governor was at that time an extremely difficult one by reason of the increasing discontent of the colonists. At the first, Wentworth's administration was very popular. He remonstrated against the taxes imposed by the English government, but sought to maintain the loyalty of the colony, and was successful in preventing the assent of Portsmouth to the non-importation agreements until 1770. In this he was aided by the fact that the Portsmouth merchants were disinclined to forego such profits as they might still obtain despite the crippled state of commerce. When the last attempt was made to compel the colonies to receive East Indian tea, he took advantage of lack of instructions from the government, and had the consignee reship the cargo to Halifax. His authority ended, however, when it was learned that he had endeavored to comply with the request of General Gage to obtain carpenters to construct barracks for the British troops at Boston, after Massachusetts workmen had refused the task. On 14 Dec. 1774 an armed attack was made on Fort William and Mary (now Fort Constitution) on Great Island, at the entrance to Portsmouth harbor, and 100 barrels of powder and some cannon and muskets were taken. Wentworth finally found it advisable to withdraw to the fort, and then to a warship in the harbor. At the Isle of Shoals he prorogued the assembly, his last official act. He went to Boston, and thence to England. From 1792 to 1808 he was lieutenant-governor of Nova Scotia. He was active in the foundation of Dartmouth College. Nine MSS. volumes of his correspondence are in the public records of Halifax. He was made a baronet in 1795.

Wentworth, John, American journalist: b. Sandwich, N. H., 5 March 1815; d. Chicago, Ill., 16 Oct. 1898. He was graduated from Dartmouth in 1836 and the same year went to Chicago where for 25 years he was owner and editor of the 'Democrat.' He studied law, was admitted to the bar in 1841, and in 1843 was elected to Congress where he served six terms. He introduced the first steam fire engine into Chicago, was active in procuring the city charter, an earnest promoter of the public school system, and in 1857 and 1860 was elected mayor. He dissolved his connection with the 'Democrat' in 1861, but did not retire from active life for many years. He gave \$10,000 to Dartmouth College, was president of its alumni in 1883 and wrote: 'Descendants of Elder William Wentworth' (1850); and 'History of the Wentworth Family' (1878).

Wentworth, Thomas. See STRAFFORD, 1ST EARL OF.

Werff, v'erf, Adriaan van der, Dutch painter: b. Kralingen, near Rotterdam, 21 Jan. 1659; d. Rotterdam 12 Nov. 1722. He became a pupil of Van der Neer, settled in Rotterdam, and in 1696 attracted the notice of the Elector Palatine, who was thenceforward his liberal patron, and who ennobled him in 1703. Among his celebrated paintings are the 'Judgment of

Solomon'; 'Christ Carried to the Sepulchre'; 'Ecce Homo'; 'Abraham with Sarah and Hagar'; and 'Magdalen in the Wilderness.' Van der Werff was particularly noted for his small historical pieces, which are most exquisitely finished, and are still in high request. His brother and pupil, **Pieter van der Werff** (1665-1718), painted portraits and domestic pieces.

Wergild, *wér'gild*, or **Weregild**, *wér'gild*, derived from the Anglo-Saxon *werr*, a man, and *geld*, satisfaction, and meaning the price in money paid either to kinsmen or to the state, or both, as satisfaction in a case of homicide or other crime against the person. The wergild extended to offenses of the highest grade. It was also sometimes exacted when the killing was not criminal, as in the case of a thief slain in battle. It was eminently a Teutonic institution, and the amount of wergild varied with different tribes. Among the Anglo-Saxons the wergild for taking the life of the king was 7,000 shillings; for an eolderman 2,400 shillings; a king's thegn 600 and a ceorl 200. In the Anglo-Saxon period an alderman or eolderman was a much more important personage than the alderman of to-day, the aldermen of all England being the first subjects of the realm, and other aldermen being governors of counties. Even kings were called aldermen. The thegn, or thane, was a minor noble, and the ceorl, or churl, a tenant-at-will of the thane, or he might be simply a serf or farm-laborer. As the value of money, measured by its purchasing power, was far greater than to-day, the wergild for king and alderman, and even for thane, must have been prohibitory save for the wealthiest members of the community, or when the state assumed the burden of payment, as in the case of an enemy of high rank killed in war, whose relatives were able to wreak vengeance for his death.

Wergild for a homicide had to be paid to the king and the kindred, and also to the thane, or overlord of the slain man. The relatives were not obliged to accept the price of their kinsman's blood, but might, if they chose, exact life for life. If the relatives were satisfied, however, it was not difficult to make terms with the king and thane. The wergild passed away when Norman succeeded to Anglo-Saxon rule, and while fines continued to be imposed on offenders, there was no escape from the capital penalty for homicide except in trial by combat.

Wergeland, *vér'gè-lánd*, **Henrik**, Norwegian poet: b. Christiansund 17 June 1808; d. Christiania 12 July 1845. He studied at Christiania, in 1836 became custodian of the university library, and in 1840 keeper of the Norwegian archives. He was one of the leaders of the Ultra-Norwegian party, waging war on all things Danish, but found opponents in Welhaven and the latter's school. In 1830 he published the dramatic poem 'The Creation, Man and Messiah,' a work of formidable length and slight literary merit. His chief publications are the narrative poems, 'Jan van Huysum's Flower-Piece' (1840); 'The Swallow' (1841); 'The Jew' (1842); 'The Jewess' (1844), and 'The English Pilot' (1844), which take high rank in Norwegian verse. His complete collected works appeared in 1852-7, a selection in 1859. Consult the biographies by Lassen (1867), Schwanenflugel (1877), and Skavlan (1892).

Werner, vēr'nēr, Abraham Gottlob, German mineralogist; b. near Bunzlau, 25 Sept. 1750; d. Dresden 30 June 1817. In 1775 he was appointed inspector and teacher of mineralogy and mining in the Mining Academy at Freiberg, in which position he remained for the rest of his life. He was the first to separate geology from mineralogy, and to place the former on the basis of observation and experience. The geological theory with which his name is connected is that which attributes the phenomena exhibited by the crust of the earth to the action of water, and is known as the Wernerian or Neptunian theory, in contradistinction to the Huttonian or Plutonic. He was nominated counsellor of the mines of Saxony in 1792, and had a great share in the direction of the Academy of Mining, and in the administration of public works. He published 'Kurze Klassifikation und Beschreibung der Gebirgsarten' (1787); 'Neue Theorie über die Entstehung der Gänge' (1771). Consult 'Life' by Frisch (1825).

Werner, Friedrich Ludwig Zacharias, German dramatist. b. Königsberg 18 Nov. 1768; d. Vienna 17 Jan. 1823. After attending Kant's lectures in his native town, he became in 1793 chamber secretary in the Prussian service, and in 1805 obtained a government post in Berlin, but two years later he retired from the public service. In 1811 he joined the Roman Catholic Church, and in 1814 was consecrated priest at Aschaffenburg. Taking up his residence in Vienna, he became known as an eloquent preacher and later was appointed head of the chapter of the cathedral of Kammer. Werner's dramatic works reveal much of the power and pathos characteristic of Schiller, but overlaid to a constantly increasing extent, as he advanced in years, by mystical and undramatic elements. The chief of them are: 'Die Söhne des Thals' (1804); 'Das Kreuz an der Ostsee' (1806); 'Martin Luther oder die Weihe der Kraft' (1807); 'Attila' (1808); 'Wanda' (1810); 'Die Weihe der Unkraft' (1813), a sort of retraction of the earlier play on Luther; 'Kunigunde die Heilige' (1815); 'Der 24. Februar' (1815); 'Die Mutter der Makkabäer' (1820).

Wernerite, an important rock-forming mineral, occurring in cleavable-granular, indistinctly-fibrous or columnar masses, or often in large, coarse crystals. These are tetragonal prisms terminated by pyramids, and show good prismatic cleavage. The hardness is 5 to 6 and specific gravity about 2.7. The most common colors are white or gray; lilac is also quite abundant; occasionally greenish and brick-red varieties are found. Wernerite is a member of the scapolite group (q.v.) and is intermediate in composition between meionite and marialite, being a silicate of aluminum, calcium and sodium, with chlorine. It usually occurs in crystalline limestone. Among its many localities a few of the most important are Arendal, Norway; Bolton, Massachusetts; northern New York, Ontario and Quebec. The mineral was named (in 1800) in honor of the distinguished mineralogist, A. G. Werner.

Werwolf, wēr'wulf, or Werewolf, wēr'-wulf, a human being transformed into a wolf, according to a belief which has prevailed in all ages and ignorant and superstitious communities. Herodotus, with great naïveté, tells us that when he was in Scythia he heard of a people which

once a year changed themselves into wolves, and then resumed their original shape; "but," adds he, "they cannot make me believe such tales, although they not only tell them, but swear to them." But the lycanthropes of the Middle Ages, or *loup-garous*, as they were called by the French, were sorcerers, who during their wolf-hood had a most cannibal appetite for human flesh. The Germans called them *Währwölfe*. Many marvelous stories are told by the writers of the Middle Ages of these wolf-men or *loup-garous*, and numerous authentic narratives remain of victims committed to the flames for this imaginary crime, often on their own confessions.

It is certain that faith in the power of witches to assume the shape of animals, such as wolves, dogs, cats, or horses, existed at a comparatively recent time, and is probably not extinguished yet in Western Europe. In the Balkan States, or part of them, belief in the werwolf flourishes to this day, along with the kindred vampire superstition. An old writer says that "the werewolves are certain sorcerers, who, having anointed their bodies with an ointment which they make by the instinct of the devil, and putting on a certain enchanted girdle, do not only unto the view of others seem as wolves, but to their own thinking have both the shape and nature of wolves, so long as they wear the said girdle; and they do dispose of themselves as very wolves, in worrying and killing, and most of human creatures."

The werewolves were said to have in some instances a special hatred of religion and its devotees, and this, coupled with the charge of devouring human flesh, left no doubt as to the fate of anyone who fell under suspicion of being a werwolf. The superstition itself was doubtless due in part to the brutal and savage aspect of human beings who, owing to melancholia or other forms of insanity, went wild in the woods—an occurrence not infrequent in remote districts in the Middle Ages. It was also in all probability connected with the belief, which was a prominent feature of mythology, in the power of the gods and inferior spirits to enter the bodies of animals, and with the doctrine of transmigration of souls, common alike to the ancient Egyptians, the followers of Pythagoras and the Hindus. See WITCHCRAFT.

Wesel, vā'zēl, Germany, a town in the Rhine province of Prussia, on the right bank of the Rhine, at the mouth of the River Lippe, 35 miles north by west of Düsseldorf. The Rhine is here crossed by a railway and a pontoon bridge, and the Lippe by a railway and two other bridges. The fortifications were demolished in 1890, except the citadel and four outer forts, one of which, Fort Blücher, is on the left bank of the Rhine. The Berlin gate, with statues of Hercules and Minerva, dates from 1722. The principal church was founded in the 12th century, and dates in its present form from 1521. It was restored in 1883-96. The town-hall, with a Gothic façade, was completed in 1390. The other buildings and institutions include the Lower Rhine Museum, formerly a French church; the artillery barracks, formerly a Dominican monastery; a royal gymnasium and other higher educational institutions; two hospitals, an orphanage, and the fortress prison. Soap, wire, and cement are manufactured, and

there are also sugar refineries, brick works, flour and oil mills, steam saw-mills, etc., besides a trade in timber, grain, etc. There is ample harbor and quay accommodation. Wesel can be traced back to the 8th century. It was a member of the Hanseatic League, and adopted the Reformation in 1540. It came into Prussian possession in 1814.

Weser, vä'zër (Latin, *I'isurgis*), a river of Germany, formed by the junction of the Fulda and Werra at Münden, between the provinces of Hanover and Hesse-Nassau. It flows tortuously first northwest, then north-northeast between Westphalia and Brunswick and after a circuitous northwestern course, traverses the town and the territory of Bremen, forms the boundary between Hanover and Oldenburg, at Elsfleth turns almost due north, and falls by a wide mouth, encumbered with sandbanks, into the German Ocean. Its whole course is about 430 miles. It is navigable by barges to some distance up both head-streams, but the practical limit of summer navigation is Hameln. The lower part, from Bremen to Bremerhaven, has been deepened and improved for large vessels.

Wesley, wës'li, Charles, English clergyman and hymn-writer, younger brother of John Wesley: b. Epsom, Lincolnshire, 18 Dec. 1707; d. London 29 March 1788. He was educated at Christ Church, Oxford, and there he began, he says, "to observe the method of study prescribed by the university," adding, "this gained me the harmless nickname of Methodist"—a word at first apparently without religious significance, and meaning one who affected method. In 1735 he was ordained priest. Charles accompanied his brother to Georgia, where he was not very successful, and having returned to England in 1736, became unlicensed curate of St. Mary's, Islington, where he remained until 1739. In 1739-56 he was an active itinerant preacher. He differed from his brother on some doctrinal and other points, holding, for example, that perfection must be attained by a gradual process. After residing for some years at Bristol and Bath, he went to London in 1771. He is said to have written 6,500 hymns, of which many are well known, about 500 being said to be in general use. Consult the biographies by Jackson (1849) and Telford (1866), and Julian, 'Dictionary of Hymnology' (1892).

Wesley, John, English clergyman, founder of Methodism: b. Epworth, Lincolnshire, 17 June 1703; d. London 2 March 1791. He was a younger son of the Rev. Samuel Wesley (q.v.), and was educated at Charterhouse, and at Christ Church, Oxford. He took his degree in 1724, was ordained deacon in 1725 and became a fellow of Lincoln College, in which he was appointed Greek lecturer and moderator. He was of a serious and religious turn of mind, and books which impressed him powerfully were the 'Imitatio Christi' and Taylor's 'Holy Living and Holy Dying.' He took priest's orders in 1728, and about the close of 1729 was called from acting as his father's curate to perform the duties of his fellowship in person. At Oxford he found an association of students of which his brother Charles was a member. It was known by various nicknames, among which were the Holy Club, the Bible Moths, the Sacramentarians, and the Methodists. It appears that all the associ-

ation did at this time to earn these opprobrious epithets was to meet on Sunday evenings to read the Scriptures, and on other evenings to read secular literature. John Wesley joined this society, which gradually became exclusively religious in its object, and highly ascetic in its tone. Its members fasted twice and communicated once a week, visited prisons and the sick, and engaged frequently in prayer, meditation, and self-examination. Among the members were Hervey and Whitefield. At the time John Wesley joined it the society numbered very few members, but it gradually increased, though it never became a large body. This induced him to decline his father's living at Epworth, that he might continue to exercise his influence at the university. During his residence at the university he became acquainted with Law, author of the 'Serious Call to the Unconverted,' who exercised much influence over him. In 1735 he accepted an invitation from Gen. Oglethorpe to preach to the colonists of Georgia. He sailed on 10 Dec. with his brother Charles and a considerable body of Moravians. During his visit to the colony he paid his addresses to Sophia Hopkey, niece of the chief magistrate of Savannah, or rather, as the story is told, received her advances with favor, but ultimately declined to marry her. Miss Hopkey married a Mr. Williamson, and Wesley, without assigning a reason, refused to admit her to the communion. Her husband threatened legal proceedings, which were not enforced, but Wesley, on account of this event, left the colony, "shaking the dust from his feet." He reached England 1 Feb. 1738, just as Whitefield, under whose preaching Methodism had made great progress, sailed for Georgia. At this time an important event took place in the inner religious life of Wesley. He was converted, according to his own account, about a quarter to 9 o'clock on the evening of 24 May 1738, at a meeting to which he had gone very unwillingly, while Luther's 'Preface' to the Epistle to the Romans was being read. On 13 June he set out for Germany to visit Herrnhut. He met Count Zinzendorf at Marienborn, spent a fortnight at Herrnhut, and returned to England about the middle of September. Whitefield returned from Georgia soon after, and became intimately associated with Wesley. He began open-air preaching near Bristol in the following February, and his example was soon followed by Wesley. On 11 Nov. 1739 Wesley first preached at the Foundry, a disused structure, formerly employed by the government for casting brass ordnance. This he enlarged and repaired, and until 1778 it remained the Methodist headquarters in London. Somewhat later he founded the 'United Society' for week-day meetings. From the beginning of this society the inception of Methodism is generally dated.

In July 1740 Wesley separated from the Moravians, on account of doctrinal differences. He soon afterward separated from Whitefield, but without a permanent personal breach. Wesley had now sole control of the religious body which adhered to him, and he devoted his entire life without intermission to the work of its organization, in which he showed much practical skill and admirable method. His labors as an itinerant preacher were incessant. He had no permanent residence, and never inter-

mitted his journeys on account of the weather. He would ride from 40 to 60 miles in a day, read or wrote during his journeys, and frequently preached four or five times a day or oftener. He married in 1750 Mrs. Vazeille, a widow with four children, but his habits of life, which he did not attempt to accommodate to his wife, produced an alienation, and they finally separated. Wesley held strongly to the principle of episcopacy, though not a believer in the apostolic succession; and he never formally separated from the Church of England. His collected works were published by himself in 1771-74 in 32 volumes. But in these only a part of his literary output was included, his publications being of the most miscellaneous character, including grammars, an English dictionary, biographies, manuals of history, logic, medicine, which together brought him in large sums of money. In 1780 he commenced a monthly, the 'Arminian Magazine,' which he edited during his life, and which after his death was merged in the 'Methodist Magazine.'

Against pre-Revolutionary troubles in America he directed 'A Calm Address to our American Colonies' (1775), 'A Calm Address to the Inhabitants of England' (1777), and 'A Serious Address' (1778). He also wrote many hymns, which are included in the 'Poetical Works of John and Charles Wesley' (1868-72). A John Wesley bicentary was celebrated in June 1903. Consult the biographies by Hampson (1791); Coke and Moore (1792); Whitehead (1791-3); Moore (1824-5); Southey (1820), with 'Notes' by Coleridge and 'Remarks' by Knox, in 1846; Watson (1831); Tyerman (1870-1); Rigg (1875); Green (1881); and Overton (1891); Wesley's 'Journals' and 'Correspondence,' parts of which are to be found in the various editions of his collected works, first published under his own editorship in 1771-4; Taylor's 'Wesley and Methodism' (1851); Urlin, 'Wesley's Place in Church History' (1870); a bibliography by Green (1896); and standard histories of Methodism. See also **METHODIST EPISCOPAL CHURCH, THE**.

Wesley, Samuel, English clergyman and poet: b. Winterborne-Whitchurch, Dorsetshire, 17 Dec. 1662; d. Epworth, Lincolnshire, 25 April 1735. He was the father of Charles, John, and Samuel Wesley, Jr. Graduated from Exeter College, Oxford, in 1688, he was ordained priest in 1690, became rector of South Ormsby, Lincolnshire, in that year, and in 1695 of Epworth in the same county. He wrote 'Life of Christ: An Heroic Poem' (1693); 'Eupolis's Hymn to the Creator' (1778); and other works, including the posthumous 'Dissertations in Librum Jobi' (1735), etc. He is best known by the two hymns to be found in Methodist hymn books, 'Behold the Saviour of Mankind' and 'O, Thou, Who, When I Did Complain.'

Wesley, Samuel, English hymn-writer, son of the preceding: b. Spitalfields, London, 10 Feb. 1691; d. Tiverton 6 Nov. 1739. He was head-master of Bundell's grammar school in Tiverton, in 1732-30. He did not embrace Methodism with his brothers, and wrote of it as "a spreading delusion." He was graduated from Christ Church, Oxford, in 1715, and took orders. He is best known by his hymns in the Methodist hymn book. Among the titles of individual

volumes by him were: 'Poems on Several Occasions' (1736); reprinted in 1808 and 1862; and 'The Christian Poet' (1735). Consult: Tyerman, *Life and Times* (1866).

Wesleyan Methodists. See **METHODISM IN AMERICA**.

Wesleyan University, located at Middletown, Conn. It was established in 1831 under the auspices of the Methodist Episcopal Church, being the first educational institution of collegiate grade established by that church in the United States. The founders of the college were offered the buildings and site of the American Literary, Scientific and Military Institute, if an endowment of \$40,000 were raised; the gift was accepted and its conditions complied with. In 1868-78 the university's material resources were largely increased, and several new buildings erected; in 1872 women were admitted, and in the same year a new curriculum established with a wide range of electives; in 1900 the number of women admitted was limited to 20 per cent of the whole number of students in the preceding year. The university offers three courses, classical, Latin-scientific, and scientific, leading to the degrees of A.B., Ph.B., and B.S., respectively. In each of these courses the work of the first year is nearly all required; after the first year, the amount of required work is progressively diminished; a wide range of electives is offered, naturally limited to a certain extent by the degree to be obtained. Courses in graduate work are provided leading to the degrees of A.M. and M.S. There are five endowed scholarships, also the scholarships established by the trustees for the payment of the tuition of students considered worthy of such assistance. The students maintain an athletic association, a university glee club, mandolin and guitar clubs, and a number of the Greek letter fraternities; these latter have their own houses where many of the students live. Athletic sports are under the control of an athletic council on which undergraduates, alumni, and faculty are represented. The university has a campus of 14 acres on high ground overlooking the Connecticut River; the buildings include North College (the first building erected by the Military Academy), South College, the Judd Hall, the observatory, with a 12-inch equatorial telescope, Rich Hall (the library), the Wilbur Fisk Recitation Hall, and the Scott Laboratory of Physics, both erected in 1903, and the Fayerweather Gymnasium. The library in 1904 contained 63,000 volumes. In 1902-3 a movement was begun to raise \$1,000,000 to add to the endowment fund. The students in 1910 numbered 365, of whom about 50 were women; the faculty numbered 42.

Wessel, vés'sel. Johann (surnamed **GANSEVOORT** (Dutch, **GONSEVOORT**), Dutch theologian: b. Groningen 1419 or 1420; d. 1489. He passed the latter part of his life in retirement in his native country, part of the time in convents. He was a decided opponent of the scholastic theology, and in intimate relations with some of the prominent humanists, as Agricola and Höck, yet in his own views leaned strongly toward mysticism. He regarded Christianity as something entirely spiritual, confined to a man's own heart and God. The Scriptures, according to him, are the living source of all true faith; the Church is based upon a compact; there is a

WESSEX — WEST BAY CITY

general priesthood of the rational universe; faith is to be reposed only in an orthodox pope, and not in every council; sin can be forgiven by none but God; excommunication has only an external influence; indulgences refer only to ecclesiastical penalties; the true satisfaction for sin is a life in God; and purgatory is nothing but the purifying influence of a longing after God. After his death some of his works were burned as heretical; his 'Farrago Rerum Theologicarum' was published with a preface by Luther (1522). The most complete edition of his works is that edited by Lydius (1617). Consult Muusling, 'Commentatio Historica-Theologica de Wesseli' (1831); Ullmann, 'Reformatoren vor der Reformation' (1847).

Wessex, wēs'ēks, England, a former kingdom, from the 6th to the 9th century, one of the most important of the Saxon heptarchy, and that in which the other kingdoms were ultimately merged in the reign of Egbert in 827. Wessex, signifying West Saxons, as an independent unit of the heptarchy, occupied a territory now comprised in Dorset, Wilts, and parts of Somerset and Hants. See EGERT; ENGLAND.

West, Benjamin, American painter: b. Springfield, Chester County, Pa., 10 Oct. 1738; d. London 11 March 1820. After some instruction from William Williams, a Philadelphia painter, and having painted 'The Death of Socrates' for a gunsmith, he established himself as a portrait painter at Philadelphia at five guineas per portrait, and subsequently followed the same profession in New York. In July, 1760, he visited Rome, whence he proceeded to Florence, Bologna, Venice, and Parma. Returning to Rome, he painted 'Cimon and Iphigenia' and 'Angelica and Medora.' He was elected member of the Academies of Florence, Bologna, and Parma, and, visiting England in 1763, was so well patronized that he determined to make it his future residence. He executed a historical painting of 'Agrippina Landing with the Ashes of Germanicus,' for Drummond, archbishop of York, who introduced him to George III. The king became his steadfast patron, and gave him commissions for many years. In 1772 he was made historical painter to the king, in 1790 surveyor of the royal pictures. He was one of four selected to draw up a plan of the Royal Academy, was one of the original members, and there exhibited his 'Death of General Wolfe' (now in the Grosvenor gallery, London), in 1771. In this canvas West departed from the custom of the artists of the day of giving the characters Greek or Roman costumes. Reynolds, who had endeavored to dissuade him, later said, "I retract my objections. I foresee that this picture will not only become one of the most popular, but will occasion a revolution in art." Woollett's plate after this work had the largest sale of any engraving of modern times. West painted a series of historical works for Windsor, and for the chapel a series on the progress of revealed religion, divided into four series, antediluvian, patriarchal, Mosaic, and prophetic. On the death of Reynolds, in 1792, he was unanimously elected president of the Royal Academy. When George III. became insane the order for painting the religious series was abruptly recalled and the pay stopped.

West had finished 26 pictures, and sketched the entire series. He afterward painted a number of religious and historical pictures on very large canvases. Among them may be noticed 'Christ Healing the Sick' (in the National Gallery), the 'Crucifixion,' the 'Ascension,' and 'Death on the Pale Horse' (Pennsylvania Academy). The 'Battle of La Hogue' is among the best of his historical pieces. West's pictures numbered about 400. They are chiefly of heroic size, and display much inventive power and great skill in composition. But they are monotonously reddish-brown in coloring, and, despite their facility, lack spirit and imaginative value. His position in early American art has won for him a recognition somewhat in excess of his actual merit. Consult Galt, 'Life and Studies of Benjamin West' (1820); Tuckerman, 'Book of the Artists' (1867); and various dictionaries of art.

West, James Harcourt, American publisher and Unitarian clergyman: b. Melrose, Mass., 13 Jan. 1856. He was educated at Tufts Divinity School, was engaged in printing and as a newspaper correspondent in 1873-84, and in 1884-94 was minister in charge of various Unitarian and Congregational Societies. He founded the 'New Ideal Magazine' in Boston in 1889 and has been engaged as a publisher since 1888. His writings include: 'Holiday Idlesse, and Other Poems' (1886); 'Uplifts of Heart and Soul' (1887); 'The Complete Life' (1888); 'Visions of Good—Poems of Freedom' (1892); 'In Love with Love' (1894); etc.

West, Thomas, BARON DELAWARE OF DELAWARE, English colonial governor of Virginia: b. 9 July 1577, d. at sea off the Atlantic coast of America 7 June 1618. He was educated at Queen's College, Oxford, in 1597 was returned to Parliament for Lymington, fought in the Low Countries and in Ireland, in 1609 became a member of the council of the Virginia Company, and in 1610 was made first governor and captain-general for life. On 10 June he arrived at Jamestown, where he soon restored order and comparative prosperity. He established a post at Riquotau (now Hampton), and built two forts. At the time of his coming want and mismanagement had almost compelled the settlement to disperse. By June 1611 he was again in England, where he printed a very favorable report as 'The Relation of the Right Honorable the Lord De-La-Warre.' In March 1618 he set sail once more for Virginia, but he died on the voyage. Consult Neill, 'The Early Settlement of Virginia' (1878); 'Proceedings of the Virginia Company' (Virginia Hist. Soc. 1880).

West Bay City, Mich., city on the Saginaw River, and on the Grand Trunk, the Michigan C., and the Detroit & M. R.R.'s; opposite Bay City and 12 miles north of Saginaw. It is connected with Bay City by several railroad bridges. It is in an agricultural region, and it has a number of industries connected with lumber products. The chief manufacturing establishments are flour mills, lumber and planing mills, sugar-beet factory, sash and door factories, chicory factory, and salt works. It has also shipyards, foundry, and machine shops. In 1900 (government census) the city had 121 manufacturing establishments, which were capitalized for \$2,323,910 and in which were 2,153

WEST BEND—WEST INDIES

employees whose annual wages amounted to \$868,504. The raw material used in the manufacturing cost, each year, \$2,204,668 and the value of the annual products was \$3,763,522. The city owns and operates the electric-light plant and the water-works. The educational institutions are a public high school, public and parish graded schools, and a public library. The two banks have a combined capital of \$100,000 and deposits amounting to \$618,900. Bay City and West Bay City have been merged (1910) into the one municipality, Bay City (q.v.). The government of West Bay City was administered under a charter (1897) which provided for a mayor, who held office two years, and a council. Pop. (1890) 12,981; (1900) 13,119; of Bay City (1910) 45,166.

West Bend, Wis., city, county-seat of Washington County; on the Milwaukee River, and on the Chicago & Northwestern Railroad; about 35 miles north of Milwaukee. It is in an agricultural and stock-raising region. The chief manufactures are flour, beer, harnesses, spokes, hubs, and pocket-books. It has grain elevators, machine shops, foundry, and creamery. There are six churches, public and parish schools, and one bank. Pop. (1910) 2,462.

West Bromwich, brūm'ich, England, a manufacturing town in Staffordshire, between Wednesbury and Birmingham. The principal buildings include the town-hall with a massive tower; a number of fine modern churches; several chapels of different denominations; public schools; an institute, art and technical schools, a free library, and a hospital. There is a fine public park. West Bromwich has a share in the mining and manufacturing industries of this busy district, and has grown largely of late years, carrying on the manufacture of iron goods of various kinds, smelting, brass-founding, etc. Pop. about 68,000.

West Chester, Pa., borough, county-seat of Chester County; on the Wilmington & B. and the Philadelphia R.R.'s; about 27 miles west of Philadelphia. It was originally called Turk's Head, but in 1786 the county was divided, and the name was changed to West Chester when it was made the county-seat. The new county was called Delaware, but it retained the old county-seat, Chester.

West Chester has a number of manufacturing establishments, among which are carriage factories, creameries, sash and door factories, and manufactures of hosiery, umbrella tags, and wood products. The principal public buildings are the Chester County Hospital, the county court-house, prison, theatres, a large convent, and the municipal buildings. Marshall square contains a soldiers' monument and a handsome fountain. The educational institutions are a State Normal School, Villa Maria Academy, Friends' Select School, The Darlington Seminary, West Chester Business College, a public high school established in 1865, public and parish schools, a public library, a law library and three school libraries. There are eight banks; the three national and one of the state banks have a combined capital of \$650,000, and the five (national and state) have (1903) deposits amounting to \$2,864,050. Pop. (1890) 8,028; (1900) 9,524; (1910) 11,767.

West Farnham, Canada. See FARNHAM.

West Hoboken, N. J., town in Hudson County; adjoining Hoboken and near Jersey City; about one and one half miles from the Hoboken ferry on the Hudson River. It is on elevated land which rises somewhat abruptly from the land along the river at Hoboken. In 1900 (government census) the town had 177 manufacturing establishments, which were capitalized for \$4,042,373 and in which there were 3,028 employees, to whom were paid annually, \$1,248,244. The total cost of the raw material used annually was \$2,829,789, and the value of the finished products was \$5,491,760. The five silk factories were capitalized for \$3,327,900. They used annually raw material which cost \$2,117,267, and the value of the yearly products was \$3,661,054. The principal public buildings are Saint Michael's Monastery (Passionist Fathers) and the Dominican Convent. The educational institutions are a theological school, at the Monastery, for their own members, a high school established in 1897, public elementary schools, and two large parish schools. The Hudson Trust Company has a capital of \$900,000, and (1903) deposits amounting to \$8,500,000. Pop. (1890) 11,665; (1900) 23,049; (1910) 35,403.

West Houghton, hō'ton, England, a township in Lancashire, five miles west-southwest of Bolton, with manufactures of silk and cotton, and coal-mining.

West Indies (more precisely, **West Indian Islands**, the name "West Indies" having for centuries been employed to designate parts of the mainland as well, and being still so used by some good writers): the archipelago which includes the Bahamas and the Great and Lesser Antilles. The total land area is about 95,000 square miles—twice the size of New York; the islands are, however, dispersed far and wide over a region continental in size, which extends from lat. 10° N. to 28° N. and from lon. 58° W. beyond 85° W. For the geographical subdivisions of the main groups, see ANTILLES and BAHAMAS; for the geologic relations of some of them to the mainland portions of the Antillean continent, see CENTRAL AMERICA and CARIBBEAN SEA. It will presently be made clear that the resemblances between the islands are actually less marked than the differences, and it is obviously true that the latter are very much the more worthy to receive attention at a time when one island after another claims the sympathy of the world—and especially of the United States—on the ground that its conditions are exceptional; the reader is therefore referred to the separate articles PORTO RICO, CUBA, SANTO DOMINGO, DOMINICAN REPUBLIC, JAMAICA, MARTINIQUE, DOMINICA, GRENADA, GUADELOUPE, BARBADOS, etc., in which the characteristic features of each are mentioned, though briefly. The distinctions cannot be quite fairly or helpfully presented in any other way, since every important insular community must eventually form the subject of a separate study.

To pass from a western to an eastern point in this archipelago, one may be obliged to sail about 2,000 miles; and to pass from its northernmost to its southernmost island one must sail more than 1,500 miles. This wide dispersion is the fact which should be first noted. The next step is to realize fully the disjunctive political conditions, the results of the distribu-

WEST INDIES

tion of the islands among a number of competing nations. Let us now consider the political subdivisions. The British possessions are The Bahamas, including 20 inhabited and many desert islands; Jamaica, with dependent Cayman Islands, etc.; Windward Islands, including Grenada (the governor's residence), Saint Lucia, Saint Vincent and the Grenadines, Barbados, east of the Windward Islands, Leeward Islands, comprising Antigua (seat of the government of the colony), the Virgin Islands, Saint Kitts (Saint Christopher), Nevis, Anguilla, Dominica and Montserrat, and Trinidad and Tobago, near the South American coast. The annual value of the exports from the British West Indian Islands is about \$31,500,000 (approximate average for the years 1899-1901), and of their imports about \$34,000,000; revenue and expenditure (exclusive of parliamentary grants) each being about \$10,000,000 annually during the same period of three years. The Danish possessions are the small islands of Saint Thomas, Saint Croix or Santa Cruz and Saint John, with total area 138 square miles, population 120,892 (in 1901), and foreign trade about \$30,000 in the same year, imports being valued at a little more than exports. A treaty for the sale of these islands to the United States was signed 24 Jan. 1902, and rejected by the Danish Landsting 22 October next following. French possessions are: Guadeloupe and its dependencies, and Martinique, their total area being about 1,068 square miles and total population about 360,000, combined exports about \$8,500,000 and imports about \$9,500,000. A French and Dutch possession is the island of Saint Martin, 38 square miles in area, of which it has been well said: "The political complexion of Saint Martin is peculiar. Seventeen square miles of the northern section belong to France and the rest to Holland, while the settlers, largely blacks, are principally British, who outnumber both the Dutch and French. About 3,000 of the inhabitants are in the French portion of the island, and 5,000 in the Dutch" (Hill's 'Cuba and Porto Rico,' etc.); furthermore, "each maintains an administrative force as large as that of the State of Texas." The Dutch possessions — fragments on opposite sides of the Caribbean Sea — are the islands of Curaçao, Aruba, Bonaire or Buen Ayre, Saint Eustache, Saba and part of Saint Martin, as just stated. Venezuelan possessions are some of the islands, not appropriated by the English or Dutch, in the east-and-west line between Trinidad and the Gulf of Maracaibo. The list is completed by adding Cuba, a republic, subject in certain matters to the control of the United States; Porto Rico, with the small neighboring islands, a possession of the United States; and the Isle of Pines. Mr. Hill's observation in 1898 was that, "As we sail down the eastern islands, hardly a score in number . . . we find five foreign flags and no less than a dozen distinct colonial governments . . . with no shadow of federation between them, or even co-operation of any kind." For example, Dominica, though lying between Guadeloupe and Martinique, and within sight of both, is commercially farther from them than from England, because it is cut off from the French neighbors by tariff and quarantine laws.

Edwards, in his history of the British West Indies, says that the "state of the population" in the islands which he described in 1791 was as follows. Whites, 65,305, and blacks, 455,684.

The proportion of Caucasians has decreased owing to causes mentioned in the articles JAMAICA, etc. The principal attraction of these islands for immigrants from Great Britain and white residents (what there was left of it after the manumission of the slaves which was completed in 1838) ceased when the cane-sugar industry became unprofitable; an economic tendency which has so increased that between 1899 and 1903 loans or subventions amounting to more than \$4,600,000 have been provided by the British Parliament for the benefit of the dependent islands generally or specifically for the sugar producers. To speak of this as a new or temporary crisis is absurd: it is an old story. Anthony Trollope, when he wrote of 'The West Indies and the Spanish Main' in 1859, said: "That Jamaica was a land of wealth, rivaling the East in its means of riches, nay, exceeding it as a market for capital, as a place in which money might be turned; and that it now is a spot on the earth almost more poverty-stricken than any other — so much is known almost to all men." Now, such distress, long-endured and notorious, has more or less discouraged immigration, commerce, and other influences that make for uniformity in population, manners and usages. Mr. Hill's assertion that "each of these islands is breeding a different species of mankind" may seem at first view rather extravagant; but when we reflect that geography, politics and poverty combine to isolate and segregate those communities, we shall regard the following statements as decidedly moderate: "The West Indian people represent many original stocks, which have developed variations of habits and customs in their New World environment. They are practically divisible into three great races, the white, colored and black, modified by Spanish, English and French civilizations." The influence of the aboriginal stock should by no means be overlooked (see CARIB, PORTO RICO, CUBA, etc.), nor can we regard that of the Dutch and Danes as a negligible quantity. Mr. Hill writes "In the countries in which the French race habit has been implanted, Haiti, Martinique and Guadeloupe, there has resulted a more complete elimination of the Caucasian type than in either the English or (until 1898) Spanish islands. . . . The black races of the West Indies and their habits are most interesting studies. Gathered as they were from numerous tribes of Africa, and settled upon the different islands, they naturally show not only differences in inherited qualities, but in those habits acquired from different masters for which the African is noted. Thus there are English, French, Spanish, Irish, Scotch and Dutch negroes in the various islands." Again, differences in topography, soils, flora and climate, which, as we have said, require separate studies, have been summarized most intelligently by Mr. Hill, who writes: "These islands, far from being alike in natural features and economic possibilities, present great extremes. Some are low, flat rocks barely peeping above the sea; others gigantic peaks rising straight to the clouds, which perpetually envelop their summits; others are combinations of flat and rugged types. Some present every feature of relief configuration that can be found within a continental area — mountains, plains, valleys, lakes; some are made up entirely of glaring white coral sand or reef rock; others are entirely composed of black volcanic rock, and still others are a con-





WEST PITTSBURGH—WEST POINT

bination of many kinds of rocks. Many are as arid as a western desert and void of running streams, and others have a most fertile soil, cut by a hundred picturesque streams of living water, and bathed in perpetual mist and daily rainfall. Some are bordered only with the fringing salt-water plants or covered with thorny coriaceous vegetation; others are a tangled mass of palms, ferns and thousands of delicate, moisture-loving plants which overwhelm the beholder with their luxuriance and color. Some are without human inhabitants; others are among the most densely populated portions of the world" (for example, Barbados: 1,120 to the square mile). "The diverse configuration produces climatic differences, and each kind of rock weathers into its peculiar soil. . . . Some of these islands, through possibilities of a diversified agriculture and hygienic condition, are adapted to higher civilization, and others, either through sterility or ruggedness of relief, are capable of supporting only inferior races." The total number of inhabitants is approximately 5,100,000.

Finally, it is important to suggest modifications of an impression, created by publications which were widely circulated in 1903, to the effect that West Indians are all anxious to emigrate; that "every family has a son or daughter in the United States, or one saving up money with the idea of going there and making a fortune"; and that the threatened exodus from the archipelago is a new manifestation. The foregoing considerations make it clear that every sweeping generalization of this kind must be more or less misleading. And, further, we should realize that a similar phenomenon has been observed at short intervals during four centuries; that there has nearly always been a tendency toward exodus from some of the islands; that, for example, it was observed in the 16th century, when the treasures of Mexico and Peru were discovered, and the Spanish authorities found themselves fairly compelled to decree that every attempt to desert the island of Hispaniola (Santo Domingo) was an offense punishable with death. Discontent will undoubtedly continue until the archipelago as a whole regains a moderate degree of prosperity, and the inhabitants shall be free to move about among the islands, seeking employment or adventure wherever such things are offered.

Consult, beside the works already mentioned, the writings of Agassiz, Humboldt, Schomburgk, Froude, Fiske, and Mahan; for descriptions of scenery, etc., Kingsley and Hearn; for the old form of rivalry in regard to control in West Indian waters, the Earl of Leicester's personal narrative, 'The voyage of Robert Dudley, afterward styled Earl of Warwick and Leicester and Duke of Northumberland, to the West Indies in 1594-1595'; also Griffin, 'List of books, with references to periodicals on the Danish West Indies': Washington, 1901.

MARRION WILCOX,
Authority on Latin-America.

West Pittston, Pa., borough in Luzerne County; on the Susquehanna River, opposite Pittston. Two bridges span the river and connect the borough with the city. It is mainly a residential borough, many of the men who do business in Pittston have their homes in West Pittston. In 1900 (government census) West Pittston had 35 manufacturing establishments which were capitalized for \$567,287 and whose

output each year was valued at \$621,996. Pop. (1910) 6,848.

West Plains, Mo., city, county-seat of Howell County; on the Kansas City, Fort Scott & Memphis Railroad; about 125 miles south of Jefferson City. It is in a region where there are farming, fruit-growing, and lumbering interests. The city ships large quantities of apples, grapes, dairy and farm products, and lumber products. The two State banks have a combined capital of \$55,000. Pop. (1890) 2,091; (1900) 2,932; (1910) 3,200.

West Point, Ga., city in Troup County; on the Chattahoochee River, and on the Atlanta & W. P., and the Western of Alabama R.R.'s; about 85 miles southwest of Atlanta. It is in an agricultural region in which cotton is one of the chief products. It has cotton gins, cotton-seed-oil mills, cotton factories, an iron foundry, and a machine shop. It has one bank which has a capital of \$75,000. During part of the Civil War it was a supply depot for the Confederate army. Pop. (1910) 1,903.

West Point, Miss., town, county-seat of Clay County; on the Mobile & O., the Southern, and the Illinois C. R.R.'s; about 95 miles north of Meridian. It was founded in 1857. It is in an agricultural region in which cotton is one of the principal products. The chief industrial establishments are wagon and carriage factories, foundries, machine shops, brick and tile works, lumber mills, sash, door and blind factories, ice factory, milling and ginning establishment, and manufactories of electro-light dynamos. It has six churches, the West Point Military Academy, the Southern Female College, and elementary schools. There is a national bank which has a capital of \$75,000. Pop. (1890) 2,762; (1900) 3,193; (1910) 4,864.

West Point, Neb., town, county-seat of Cuming County; on the Elkhorn River, and on the Fremont, Elkhorn & Missouri Valley Railroad; about 36 miles northwest of Fremont and 75 miles northwest of Omaha. It is in an agricultural region, in which the chief products are wheat and corn. It has a flour mill, creamery, grain elevator, carriage and furniture factories, stock-yards, and coal and lumber yards. The two national banks have a combined capital of \$100,000, and the state bank has a capital of \$30,000. There are a high school and graded schools and a school library. Pop. (1910) 2,000.

West Point, N. Y., United States military post, Orange County; on the west bank of the Hudson River, on the New York, O & W., and the West Shore R.R.'s, and connected by ferry with the New York Central; 50 miles north of New York. It is also a stopping point for the Hudson River daily steamers. Its site is very picturesque, the eastern end of the point slopes abruptly to the river, on the northern side the slope is more gradual, to the northwest are Crow Nest and Storm King. The government reservation contains 2,330 acres, 2,100 of which were acquired in 1790. It was occupied as a military post by the Americans during the Revolution and was strongly fortified. A part of the fortifications consisted of a strong chain stretched across the river to Constitution Island to prevent British vessels ascending the river. It was for a time Wash-

WEST POINT—WEST VIRGINIA

ington's headquarters; and in 1780 was under the command of Benedict Arnold (q.v.) whose plan to betray it to the enemy was frustrated by the capture of André (q.v.). West Point was occupied as a military post after the Revolution, and a military school was established there as early as 1794; in 1802 the Military Academy was organized, and West Point designated as the site. See MILITARY ACADEMY, UNITED STATES.

West Point, or Eltham's Landing (Va.), Engagement at. When Yorktown (q.v.) was abandoned, 4 May 1862, it was intended by Gen. McClellan that Franklin's division, followed by Sedgwick's, Porter's, and Richardson's, should be moved in transports up York River to a place opposite West Point and, striking across to the main roads, cut off the retreat of such bodies of Gen. J. E. Johnston's army as might be below, making their way to New Kent Court House. But the day before the evacuation of Yorktown Franklin had received permission to land his men, who had been on the transports several days, and it was not until the morning of the 6th that he could get them on board again and ready to sail. About 1 p.m. that day he arrived at Eltham's Landing, above West Point, landed his men and sent the transports back for Sedgwick's division. He had no instructions except to wait for orders. The division was first encamped on a plain beyond which was high wooded ground, over which ran a road from the landing to Barhamsville and thence toward New Kent Court House. Franklin proceeded to occupy the wood. Newton's brigade was put in position on both sides of the road leading to Barhamsville. Parts of Taylor's and Slocum's brigades were on Newton's left; two batteries were in his rear, and two regiments of Taylor's brigade were in reserve. Next morning Dana's brigade of Sedgwick's division continued the left of the Union line back to the river. The presence of Franklin threatened the road through Barhamsville toward New Kent Court House, on which part of the Confederate army was retreating from Yorktown and Williamsburg, and under Gen. Johnston's orders Whiting's and Hampton's brigades had been put in position to protect the road. On the morning of the 7th, soon after Dana's brigade had come up, Whiting was ordered to advance and drive Franklin back to his landing-place. His skirmishers went forward and encountered those of Newton, and closely following came Hood's Texas brigade and Balthis' Virginia battery, supported on the right by two regiments of Wade Hampton's brigade. Newton's skirmishers were driven in and closely followed, then Newton threw forward two regiments, which were driven back, and the entire line was forced out of the wood. On Hood's right Whiting's brigade protected that flank, while on his left S. R. Anderson's Tennessee brigade had come up, and by noon Franklin had been pushed back under cover of the gunboats. The Confederates then attempted to shell the transports in York River, but the range was too great, while the fire from the Union gunboats was effective, and compelled the Confederates to withdraw about 3 p.m., and resume their position near Barhamsville. Franklin's troops resumed their former position. The Union loss was 48

killed, 110 wounded, and 28 missing; the Confederate loss, 8 killed and 40 wounded.

R. A. CARMAN.

West Point Military Academy. See MILITARY ACADEMY, UNITED STATES.

West River, China. See SI-KIANG.

West Rutland, Vt., town in Rutland County; on Otter Creek, and on the Delaware & Hudson Railroad; about 55 miles southwest of Montpelier, the capital of the State. In 1887 it was set off from Rutland (q.v.) and organized as a separate town. The principal marble quarries, for which this region is famous, are in West Rutland. It has seven churches, graded schools, and a library. It is one with Rutland except in government. Pop. (1910) 3,427.

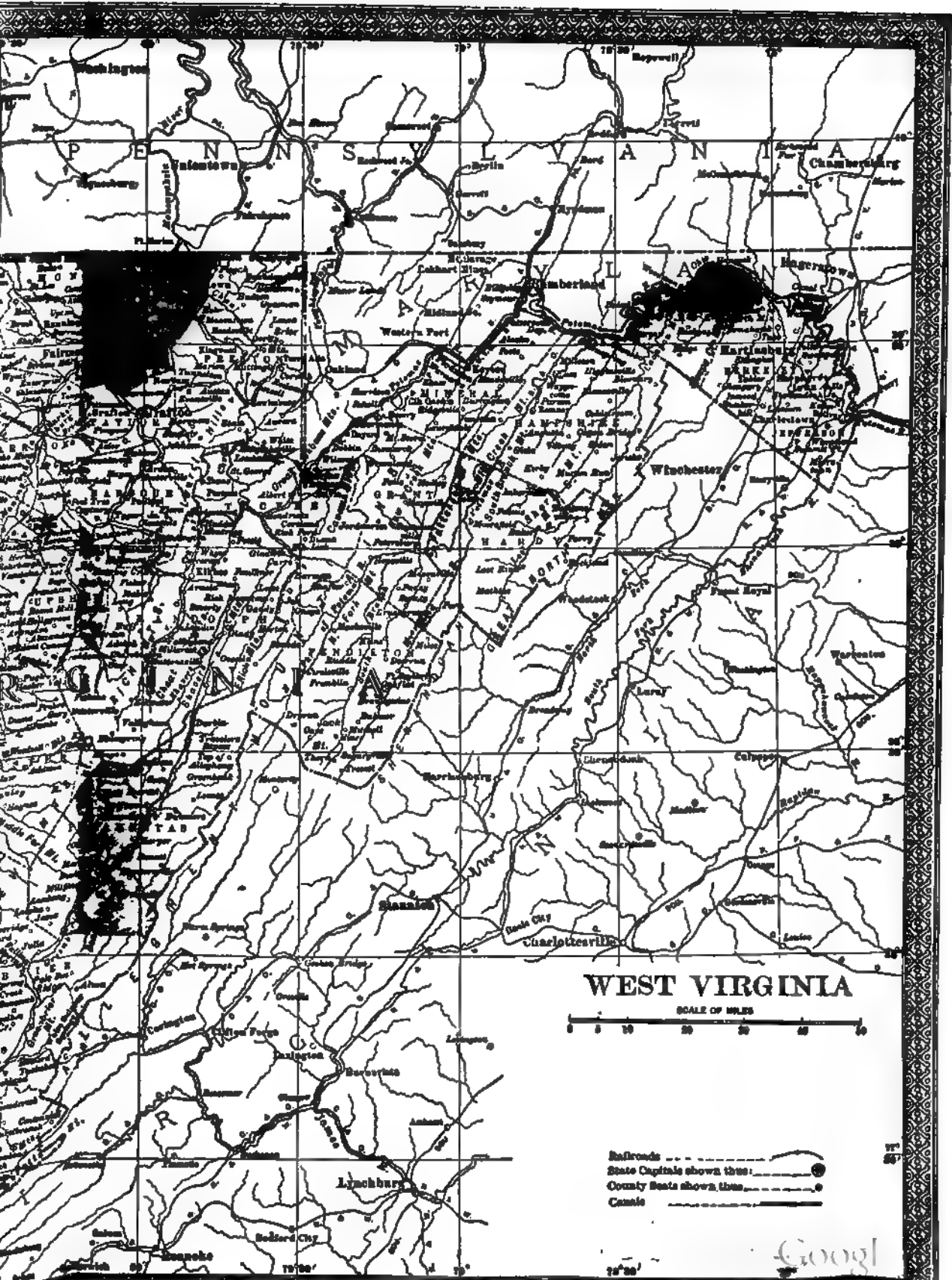
West Springfield, Mass., town in Hampden County; on the Connecticut River, and on the Boston & Albany Railroad; opposite Springfield. It was settled about 1655 and at first was a part of Springfield. In 1774 it was incorporated. It is mainly a residential town, many of the business men of Springfield have their homes here. There are several industrial establishments, chief of which are paper mills, railroad repair shops, and machine shops. Many of the people are interested in market gardening. The public library has about 8,000 volumes. Pop. (1910) 9,224.

West Troy, N. Y. See WATERVLIET, N. Y.

West Union, Iowa, city, county-seat of Fayette County; on the Chicago, M. & St. P. and on the Burlington, C. R. & N. R.R.'s; about 85 miles northwest of Dubuque. It is in an agricultural and stock-raising region. It has large creameries, flour mill, and stock-yards. There are three banks which have a combined capital of \$180,000 and (1903) deposits amounting to \$411,760. Pop. (1890) 6,676; (1900) 1,935; (1910) 1,652.

West Virginia, a state lying mainly on the western slope of the Appalachian Mountains; it was admitted to the Union 19 June 1863; area, 24,780 square miles, of which 135 square miles is water surface. The State lies between lat. 37° 6' and 40° 38' N. and lon. 0° 40' and 5° 35' W. from Washington. It is bounded on the north by Ohio, Pennsylvania and Maryland; on the east by Pennsylvania, Maryland and Virginia; on the south by Virginia and Kentucky; on the west by Kentucky and Ohio. The boundary is 1,170 miles in length and very irregular. Capital, Charleston, in Kanawha County.

Topography.—Though lying for the most part west of the Alleghany Mountains, West Virginia is not a geographic unity. With a general slope to the northwest, the surface of the State is broken into three great inclined planes, sloping from Spruce Mountain in Pendleton County to the east, to the north, and to the south. On the eastern and western sides there are broad valleys, which narrow into ravines as the upland hill region is approached. In the eastern part of the State are parallel ridges of mountain ranges, separated from each other by longitudinal and transverse valleys. The average elevation of West Virginia is greater than that of any other State east of the Mississippi River, being 1,500 feet; Pennsylvania is next with an average elevation of 1,100 feet. But in the alti-



WEST VIRGINIA

tude there is a vertical range of 4,600 feet, from 260 feet above the sea at Harper's Ferry to 4,860 feet at the top of Spruce Knob, in Pendleton County. The great range of altitude is equivalent in influence upon climate to a range of latitude of 15°, though the real range is 3.5°. Within the borders of the State, therefore, may be found the climate and products of South Carolina, Virginia, New England and Canada. In some parts of the State there has been frost in June; in Hampshire and Tucker counties are places where ice and frozen soil may be found all summer in the dense laurel thickets and spruce forests. The county of highest average elevation is Pocahontas; a very large area of the State lies above 2,000 feet; more than half lies above 1,500 feet, hence the principal industries of the higher regions are stock-raising, lumbering, and mining, since successful agriculture requires an elevation of less than 1,500 feet. The lowest depression west of the mountains is at Kenova, near the mouth of the Big Sandy River, 500 feet above the sea. Other elevations are: Bald Knob, Pocahontas County, 4,800 feet; High Knob, 4,710 feet, and Elkina, 1,922 feet, in Randolph County; Bayard, Grant County, 2,000 feet; Morgantown, Monongalia County, 901 feet; Parkersburg, on the Ohio River, 638 feet; Wheeling, in the Panhandle, 645 feet; Lewisburg, in Greenbrier County, 2,200 feet. The great range of altitude has many advantages: it gives abundant water power on all streams; it drains the mines of water and gas, and carries the coal from the mines, and stone from the quarries to the cars and to the boats—all by gravity. In this it has the advantage over the foreign coal fields and over all other American coal fields except those of Pennsylvania.

Climate and Rainfall.—West Virginia has perhaps the greatest diversity of climate of any State, caused by the numerous mountain ranges and the great variation in altitude. The country lying on the eastern slopes of the Alleghany Mountains has the warmer and drier climate. In the mountains a Canadian climate prevails both summer and winter. In the eastern and southern parts of the State are found sections where the winters are mild and the summers very warm. In the coldest regions the mercury sometimes falls to 30° below zero in winter, while in the warmest portions it sometimes rises to 96° above. In the northern part of the State at Morgantown the mean winter temperature ranges from 34° to 37°; the mean summer temperature, 70° to 75°. In the southern part of the State the average is 3° to 5° higher. The mean annual of the State is 54.4°. The date of the last killing frost in the northern part is about 15 April, of the first killing frost, about 15 October. The average yearly rainfall including melted snow is 44.2 inches. The average is greater on the western slope of the Alleghany than on the east, and greatest near the summit of the mountains. The rain clouds on the east come from the Atlantic; those on the west from the Pacific, modified by warm winds from the Gulf and cold ones from the northwest. The depth of the snowfall varies greatly with locality and altitude, from a few inches in the warmer regions to six or seven feet near the tops of the mountains.

River System.—The Alleghany watershed is in the eastern portion of the State, all except

eight of the counties lying on the western slope within the Ohio Basin. In the higher part of the State, where Pendleton, Pocahontas, and Randolph counties join, five rivers rise which flow across the State—two finally flowing eastward into the Atlantic, and three westward into the Ohio. The Ohio forms the western boundary and is navigable throughout its length. The eastern part of the State is drained by the Potomac and its tributaries. The Cheat and Monongahela flow through the northern counties, and the latter is now navigable as high up as Fairmont in Marion County. The Greenbrier and the Elk flow from the watershed to the southwest and join the Great Kanawha, which flows northwest into the Ohio. The Great Kanawha is navigable for 90 miles from the Ohio. The Big Sandy, flowing northwest, forms the southern boundary of the State. The river system of the State has been improved somewhat for navigation by the government engineers, but the interior rivers will always be more valuable for their water power than for facilities of navigation.

Geology, Mineral Resources, and Mining.—Beginning in the east with the oldest and lowest rocks, the first formation of importance is the Shenandoah or Trenton limestone, extending across Jefferson County and the eastern part of Berkeley County. It stands at an angle of 30° to 35°, is several thousand feet thick, produces a valuable commercial lime, and underlies the best farm lands of the State. In this region are the cities of Charles Town, Shepherdstown, and Martinsburg. The next important formation to the west is the indestructible Medina sandstone, a great mountain maker. It is seen in Mineral and Pendleton counties. Above the Medina sandstone is the Lewiston or Helderberg limestone in Mineral, Hampshire, Hardy, Grant and Pendleton counties. This limestone is valuable for cement and for fertilizing purposes. Resting upon this is the Monterey or Oriskany sandstone, a coarse, friable rock, producing after disintegration a barren soil. It is seen in Mineral and Morgan counties and as far south as Pocahontas. From it is obtained glass sand and material for silica brick. Next above to the west are the Hamilton shales in Randolph, Pocahontas, Greenbrier and Monroe counties. This is the region of the mineral springs, and summer resorts. The mountain limestone begins in Monongalia County, a thin, narrow formation, and thickens and widens toward the southern part of the State. The last formation of importance before the carboniferous measures is the Great Conglomerate or Millstone Grit, extending across the centre of the State. The western two thirds of the State is formed principally of coal measures made up of alternating layers of shales, sandstones, fire-clays and coal seams. Thus there are in the State three limestones of value, and three sandstones. Peat is forming in the shady swamps of the cold uplands of Preston, Tucker, Grant and Randolph counties.

West Virginia has no gold, silver, or other of the valuable metals, but is rich in the common minerals. Of these coal is the most important. The Appalachian coal fields, extending from northern Pennsylvania to western Alabama, extend from the north to the southwest through the entire length of the State, and here the coal fields are at the broadest extent, the average

WEST VIRGINIA

width being about 100 miles and the average length 150 miles, thus giving about 15,000 square miles of coal lands, of which 10,000 to 12,000 will be productive. There are three distinct parallel areas of distribution of coal deposits. (1) the New River—Pocahontas coal in the southwestern part of the State, extending from Randolph County southwest to McDowell County, and underlying ten counties; (2) the Alleghany-Kanawha coal measures underlying 17 counties and extending across the State through the central part from Preston County to Mingo, gradually widening toward the southwest; (3) the Pittsburgh coal is found in the northwestern part of the State from Braxton County to Monongalia and Hancock counties, underlying 15 counties. In the extreme northeast, in Morgan and Berkeley counties, some anthracite coal is found, but it is not profitable for mining. At present coal mining is carried on in four principal districts, two in the north and two in the southern part: (1) Fairmont or Upper Monongalia district, which produced in 1909 10,458,132 short tons, and to which the Baltimore & Ohio railroad furnishes transportation; (2) the Elk Garden or Upper Potomac district, opened by the Baltimore & Ohio and the West Virginia Central and Pittsburgh railroads, which produced 2,240,573 short tons in 1909; (3) the Pocahontas or Flat Top district in the southeast, on the Norfolk & Western railroad, producing in 1909, 19,639,106 short tons; (4) the New and Kanawha rivers district, producing in 1909, 18,521,107 short tons of coal, which was sent to market over the Chesapeake & Ohio railroad and the Kanawha River. The coal production in 1880 was 1,568,000 tons; in 1890, 7,391,654 tons in 1900, 22,647,207 tons, in 1909, 51,849,220 tons. West Virginia is second only to Pennsylvania in the coal production. In 1903 there were 479 coal mines in operation in 26 counties, as follows: Fayette, 104; McDowell, 5; Marion, 24; Kanawha, 85; Harrison, 45; Tucker, 8; Mercer, 13; Mineral, 10; Mingo, 35; Preston, 18; Taylor, 10; Barbour, 13; Putnam, 4; Marshall, 5; Ohio, 6; Randolph, 7; Raleigh, 16; Mason, 10; Monongalia, 6; Hancock, 4; and Brooke, 7. Five other counties have from one to five mines each. About ten counties not in the above list produce small quantities of coal. West Virginia coal is especially good for cooking purposes, and in nine counties—McDowell, Fayette and Tucker leading—are large coking establishments. In 1909, 3,943,948 tons of coke were produced, valued at \$7,525,922. In 1901, 403 electrical machines were used in coal mines, reducing labor to the equivalent of 4,817,943 tons. The average wage of a miner is \$52 per month. It is a significant fact that the amount of coal consumed within the State, excluding that used by transportation agencies, is very small, most of it being shipped from the State. Manufactures are not sufficiently developed to use large quantities of coal, and besides natural gas is used instead of coal in many establishments, and most of the railway companies are connected with the mining interests and encourage the long freight hauls. Metallic ores are not found in paying quantities. The value of the stone, principally limestone and sandstone, quarried in the State in 1909, was \$1,065,205; the value of the salt produced—150,412 barrels—was \$76,463. Valuable deposits of lime are found in Jefferson, Berkeley, Hampshire, Hardy, Greenbrier and

Monroe counties. Numerous mineral springs, well known as health and pleasure resorts, are found in Greenbrier, Monroe, Summers and Hampshire counties. The State owns Berkeley Springs in Morgan County, and Capon Springs in Hampshire County, through the bequest of Lord Fairfax, who left them to the people of Virginia forever.

Oil and Gas.—Both petroleum and natural gas are found in immense quantities in the northwestern section of the State. The development of both is drifting toward the Kanawha Valley. The counties producing the greater part of the oil and gas are Ritchie, Wood, Wirt, Gilmer, Roane, Kanawha, Cabell, Lewis, Pleasants, Doddridge, Harrison, Tyler, Marion, Wetzel, Monongalia, Marshall and Hancock. The gas produced in 1901 was worth \$3,954,722, in 1902, \$5,300,181. It is conveyed by pipe lines to the principal cities of the State, to Cleveland, Pittsburgh, and to other cities in adjoining States. In the production of crude petroleum West Virginia now ranks fourth of the States, producing in 1910, 22,000,000 barrels, valued at about \$25,000,000. Most of the oil is piped to Philadelphia and Baltimore.

Agriculture, Horticulture, and Stock Raising.—The total value of farm property in West Virginia in 1910 was \$262,458,000, which amount represents the land and buildings of the State's farms, \$56,848,000, the value of the buildings, and \$205,610,000, the value of the land and other improvements, farm implements and machinery were worth \$6,962,000.

The value of the farm products (1910) was \$44,768,979, of which amount animal products were worth \$19,073,790, and crops, \$25,696,189—more than twice the valuation in 1890. The gross farm income was \$36,608,119, the net income cannot be ascertained. The total land area is 15,772,800 acres, of which 9,061,000 are in farms. From the northeast corner of the State extending south and southwest to the Big Sandy River the country is mountainous with narrow valleys. There are no transportation soils, all being from disintegration of limestone, sandstone, or mixtures of shales and clays. The soil is generally fertile and does not wash into gullies, and the land is productive to the tops of the mountains. Clay soil is found in some of the higher portions, alluvial soil in the upland valleys, and unproductive sandy soil in the northeast. In the extreme northeastern counties the soil is of rich limestone. West of the mountains the broad flat hills furnish grazing for cattle, while the valleys produce good crops. The surface near the Ohio River is gently rolling and the soil—clay and sand loams—is rich. The average size of the farms is gradually decreasing and now ranges from 72 acres in Clay County to 305 in Hardy, the general average being 115, and the average value being \$1,446. The largest farms are found in the grain and stock-raising counties. White farmers (92,132) conduct 99.2 per cent of the farms, and 77 per cent of them own in whole or part the land they cultivate; 72 per cent of the colored farmers own in whole or part the land they cultivate. The average value of the negro farm is about half that of the white, and the average gross income about half as much. There are only 614 farms of 1,000 acres and over, most of them ranging from 50 to 90 acres.

On most of the farms the principal source of

WEST VIRGINIA

income was from stock-raising; hay and grain furnished the next most important source. Of live stock, horses, cattle, sheep, hogs, poultry and mules were valued in the order named. The value of animals sold and slaughtered was \$9,428,066; dairy products, \$5,088,153; poultry and eggs, \$3,721,427; wool, \$636,012. The principal crops and their values in 1910 were corn, \$16,266,000; hay and forage, \$12,150,000; wheat \$5,228,000; buckwheat, \$443,000; oats, \$1,260,000; potatoes, \$2,527,000; tobacco, \$1,318,400. The largest corn growing counties are Wayne, Kanawha, Jackson, and Mason, in the Kanawha Valley; Jefferson, Berkeley and Mason lead in the production of wheat; Hampshire, Hardy and Morgan in rye; and Preston in oats and buckwheat. Orchard fruits, principally apples, peaches, cherries, pears, plums and prunes are raised in Randolph and Mineral counties. The largest orchard in the Middle West is in Randolph County, containing 1,740 acres and 200,000 trees. Small fruits (berries) are raised in Brooke, Harrison, Ohio, and Wood counties; tobacco in Lincoln, Putnam and Cabell counties. The average expenditure on each farm for labor is \$22, which shows that the West Virginia farmer does most of his own work. The amount expended for fertilizers is very small, only \$4 per farm. The United States Agricultural Experiment Station is located at Morgantown and is conducted by the State University.

Timber.—There are 15,000 square miles of timber lands in the State, about 74 per cent of the total area. The largest hardwood mills in the world are in Pocahontas, McDowell and Randolph counties. The production in 1903 was: poplar, 180,000,000 feet; spruce, 75,000,000 feet; oak, 50,000,000 feet. There are large forests of white pine in the upland regions which have not been touched by the lumberman. The densest forests are in the eastern and southern counties. The principal trees of value found in the State are oak, both red and white, and chestnut, hickory, locust, maple, poplar, birch, hemlock, white pine, and spruce. The lumbering industry is rapidly increasing in importance as the interior of the State is opened up by railroads.

Manufactures.—In 1900 there were in West Virginia 2,586 manufacturing establishments, with a total capital of \$150,923,000, employing 68,864 persons. The total wages paid amounted to \$38,710,000, and the gross value of the products was \$161,060,000. Manufactures are located principally in the northern part of the State and along the Ohio River, which forms the western boundary. The 12 counties along the river furnish 59 per cent of the manufactures; the four Panhandle counties alone furnish 44 per cent. The localization of the manufactures is due to the shipping facilities offered by the Ohio River and to the local supply of natural gas and coal. About 31 per cent of the manufactures are found in the six cities of Wheeling, Parkersburg, Martinsburg, Huntington, Charleston and Benwood. The following are the most important manufacturing counties, each producing over a million dollars' worth: Ohio, Marshall, Wood, Kanawha, Cabell, Tucker, McDowell, Berkeley, Fayette, Randolph, Marion, Morgan, Mineral, Jefferson, and Grant. The manufacture of iron and steel is the most important of the manufacturing industries.—11 establishments employing 4,467 men, with an output valued at

\$16,514,212. The iron and steel industry is at present confined to Wheeling and vicinity and Parkersburg. The next important industry is the manufacture of lumber products, with 950 establishments, 5,327 wage-earners, and products valued at \$10,612,837. The industry third in rank is flour and grist milling, with 737 mills, 314 employees, and products worth \$5,541,353. West Virginia ranks next to Pennsylvania in the amount of coke produced. In 1900 there were 77 coke producing plants, with 3,131 employees and products valued at \$3,529,341. The United States Steel Corporation is erecting one of the largest plants in the world near Welch in McDowell county. When finished it will employ 10,000 men, and will have the largest coke producing plant outside of Pennsylvania. The leather industry employs 664 men in 46 establishments, and the products are valued at \$3,210,753. The oak and hemlock forests near at hand furnish an abundant supply of tanbark. The largest production of leather is in the eastern and northern counties. Glass manufacture is a rapidly growing industry, having 16 factories in 1900 with an output valued at \$1,871,895, and has quadrupled since that time. In the census reports for 1900 about 100 other industries are listed. All manufactures are rapidly expanding, especially the production of glass, steel, and coke. From 1890 to 1900 the value of manufactured products increased 117 per cent; from 1900 to 1903 it is estimated that there has been a further increase of 40 per cent.

Railroads.—There are more than 3,500 miles of railway in operation in the State. The principal lines are the Baltimore & Ohio, extending across the northern part of the State, besides numerous important branches covering most of the western part of the State; the Chesapeake & Ohio, crossing the southern part of the State along the Kanawha Valley from White Sulphur Springs to Kenova; and the Norfolk & Western, with four branch lines along the Big Sandy Valley in the southern part of the State from Wills to Kenova. The Wabash has surveyed a route and will build a road across the State from north to south. Other shorter railroads are: The West Virginia Central & Pittsburg, with main line from Cumberland to Harding, and five branch lines; the Kanawha & Michigan, the Pittsburg, Wheeling & Kentucky, the Dry Forks Railway, the Guyandotte Valley, the Charleston, Clendinning and Sutton, and several other short lines, besides a number of completed and partial surveys. About 1,500 miles of new road were being surveyed or were in process of construction in 1904. The Baltimore & Ohio and the Chesapeake & Ohio lines have in recent years absorbed numerous short lines within the State. The great production of coal, coke and lumber demanding transportation encourages the rapid development of the railroads.

Finances.—The State has no debt, having refused to assume any of the debt of Virginia; the tax rate is 25 cents on \$100 for State purposes and 10 cents for school purposes. The receipts for the year ending 30 Sept. 1902 amounted to \$2,348,987.89. The disbursements were \$2,292,533.86. The State had in stocks and bonds and investments \$650,336.44. The unused funds of the State are deposited with 63 state banks and draw 3 per cent interest. The chief sources of income in 1902 were: licenses, \$324,321; corporation license tax, \$399,845; railroad taxes

WEST VIRGINIA

\$201,321.43; interest on deposits and securities, \$72,675; fines, etc., \$29,324.42; poll taxes, \$163,415.75; land tax, \$298,875.25; buildings on land, \$45,254.20; lots, \$42,109.50; buildings on lots, \$89,340.54; intangible personal property, \$140,290.15; tangible personal property, \$75,890.90.

Banks and Banking.—In November 1909 there were 82 State banks in West Virginia, a large decrease in recent years; 88 national banks, an increase of 20 over the year 1903; no private banks and ten savings banks. In 1893 there were only 55 State banks. The State banks had in 1903 a paid up capital stock of \$7,731,510, an increase within the year of more than two and a half millions. The deposits in the state banks for 1902 amounted to \$32,872,669.70, and for 1903, to \$38,908,768.65; the total resources for 1902 amounted to \$42,735,099.93; and for 1903 to \$53,481,750.14. In November 1903 the national banks had a paid up capital of \$5,528,500, a million more than in 1902. In 1902 the deposits in the national banks were \$21,854,404.45; in 1903, they were \$23,349,827.21. The total resources of the national banks amounted in 1902 to \$33,751,891.50, and in 1903 to \$37,623,030.27, exclusive of United States deposits amounting to \$1,298,521.28. The one savings bank in the State is located at Wheeling, but the savings feature is popular with many banks, and savings deposits amounted in 1903 to \$4,500,000. The State legislature is forbidden to grant charters to banks, but has passed general laws under which the secretary of state grants charters to banks that have complied with the legal requirements. In order to obtain a charter a bank must have a capital of not less than \$25,000 and not more than \$500,000. Ten per cent of the capital must be paid in before the charter is granted, and 40 per cent must be paid in before the bank can open. A State commissioner of banking inspects each state bank once or more each year, but does not inspect national banks. It is his duty to see that the books and records are properly kept, and that the public is protected against loss from failure of a state bank. He has authority to call for books and papers and to require that his directions be followed. When he thinks it necessary he may, with the advice of the attorney general and the consent of the governor, petition the courts for a receiver to close up the affairs of a failing bank.

Education.—The educational system of West Virginia is rapidly becoming more efficient, and now compares favorably with those of the surrounding States. In 1902 the expenditure for public education was \$2,583,533.64, or \$2.69 per capita of the total population, an annual expenditure of \$14.18 per pupil. Out of 315,810 children of school age, 236,015 were enrolled in 6,001 schools for whites and 297 schools for negroes, under 7,098 white teachers and 278 negro teachers. By law the races must be kept separate in all schools. There are 6,021 school houses owned by the State. The average length of the school term is six months, and the average pay of teachers, \$32.04 per month, or \$189.03 per year. At Morgantown, Keyser and Montgomery are preparatory schools with an enrolment of 400, affiliated with the State University. For secondary and higher education there are six normal schools for whites enrolling about 2,000 stu-

dents at Huntington, Fairmont, Athens, West Liberty, Glenville and Sheperdstown, and three for blacks at Bluefield, Harper's Ferry, and at Institute in Kanawha County; the West Virginia University at Morgantown; Bethany College at Wheeling; West Virginia Wesleyan University at Buckhannon; Salem College; Broaddus Institute at Clarksburg; Lewisburg Female Institute; Morris Harvey College at Barboursville; Linsley Institute; Alleghany Collegiate Institute; private academies at Romney, Princeton, Alderson, Elkins, Burnsville, and in the larger cities; Business Colleges at Wheeling, Parkersburg, Clarksburg, and Charleston. The Roman Catholic Church has schools at Wheeling, Parkersburg, Clarksburg, Grafton, Huntington, Benwood, Charleston and Fairmont. In 1900 there were 89,105 illiterates over 10 years of age, 64,281 of whom were native whites, 4,730 were foreign born, and 11,094 were colored. Of the foreign born, 3,648 could not speak English.

The West Virginia Historical and Antiquarian Society was founded in Charleston in 1891, and the Trans-Alleghany Historical Society at Morgantown in 1901. The State Educational Association was organized in 1869. Each of the above associations publishes a periodical. There is a fine State museum at Charleston, administered by the Historical and Antiquarian Society.

Libraries.—In 1902 there were 1,082 school libraries with a total of 37,495 volumes. In 1900 the Bureau of Education reports 23 larger libraries in West Virginia with a total of 100,492 volumes. There are few large libraries, most of them having less than 5,000 volumes. Those of more than that number are the Wheeling Public Library, the State Library at Charleston, West Virginia University, the West Virginia Historical and Antiquarian Society, Storer College (colored), and the West Virginia Conference Seminary. In none of the libraries are there more than 25,000 volumes.

Charitable and Reformatory Institutions.—There are two hospitals for the insane at Weston and Spencer with 1,629 patients in 1900; an Industrial Home for Girls at Salem with 50 inmates; the Deaf, Dumb and Blind School at Romney with 209 inmates; the Reform School for Boys at Pruntyton, with 268 inmates; an Asylum for Incurables at Huntington; Miners' Hospitals at Welch, McKendree and Fairmont; and the State penitentiary at Moundsville. There were in 1902, 990 convicts in the penitentiary, of whom 450 are whites and 540 are negroes; the latter, though forming only one twentieth of the population, furnish more than half the criminals. The prison is more than self-supporting. The Episcopal Church maintains a miners' hospital at Paint Creek, in Kanawha County, and the Reynolds Memorial Hospital near Moundsville. The West Virginia Humane Society cares for aged people, children, and animals. It is controlled by a board consisting of one member from each congressional district, appointed by the governor.

Churches.—The churches in West Virginia in order of membership are: Methodist Episcopal; Baptist (North); Methodist Episcopal (South); Roman Catholic; United Brethren; Methodist Protestant; Presbyterian, in the U. S.; Disciples; Presbyterian, in the U. S. A.; Colored Baptists, Regular; Protestant Episcopal; Free-

WEST VIRGINIA.

1. Library of West Virginia University at Morgantown.
2. View of Cheat River in the Mountains of West Virginia.

WEST VIRGINIA

will Baptists; Lutheran, United Synod, South; Lutheran, General Synod; Baptist (South). In 1903 there were 2,024 Sunday schools in the State, with 20,545 officers and teachers and 152,955 scholars.

Population.—The population of the territory now embraced in West Virginia was 55,873 in 1790, 376,688 in 1860, 442,014 in 1870; 618,457 in 1880; 762,794 in 1890; and 958,800 in 1900. The largest city in the State is Wheeling in the Panhandle, with a population of 41,461; the other principal cities and their populations are Huntington with 31,161, Parkersburg, 17,842; Charleston, 22,996; Martinsburg, 10,698; Fairmont, 9,711; Grafton, 7,563; Moundsville, 8,918. There are 14 towns with populations ranging between 2,000 and 5,000, and 13 from 1,000 to 2,000. Of the entire population 499,242 are males and 459,558 are females, the native born number 936,349 (of whom 892,854 are white) and the foreign born 22,451, the total number of whites is 915,223, of colored, 43,567, of whom 43,499 are negroes, 56 Chinese, and 12 Indians. The foreign population is found principally in Marion, Marshall, Ohio, Tucker and Wood counties,—in the mining districts and in the cities. Among the foreigners the Germans lead with 6,537; there are 3,342 Irish, 2,921 Italians, 2,622 English and Scotch, 1,025 Magyars and Slavs, and about 600 each of Canadians, Swiss, Welsh, and Poles. The negroes are found principally in the counties of Berkeley, Cabell, Fayette, Greenbrier, Harrison, Jefferson, Kanawha, McDowell, Mineral, Ohio, and Summers. There are three distinct classes of the black population: those in the cities, the agricultural negroes, and the miners. No cities have large negro populations, Wheeling and Clarksburg having each about 1,000 and Charleston 1,700. In no county does the black population outnumber the white. The principal immigration into West Virginia, excluding foreigners, has been from New York, 2,945; North Carolina, 3,964; Ohio, 40,301; Pennsylvania, 28,927; Virginia, 61,508. Native West Virginians now living in other States are distributed as follows: in Illinois, 5,882, Indian Territory, 4,698; Iowa, 3,992; Kansas, 6,566; Kentucky, 4,383; Maryland, 9,694; Missouri, 6,153; Ohio, 30,324; Pennsylvania, 19,329; Virginia, 7,162. There are 247,979 males of voting age, of whom 14,786 are negroes. Of the white voters 23,577 or 11 per cent are illiterate, of the black voters, 5,583 or 38 per cent are illiterate. There are 186,201 families in the State, of whom 183,780 are private families; 98,469 families own their homes, and 80,799 rent homes; 94,445 families live on farms, and 70,940 own farm homes, 92,216 native whites own homes, 68,984 being farm homes; 4,269 foreign families live in their own homes, and 1,983 negro families own their homes. Pop. (1910) 1,221,119.

Militia and National Guard.—There are 200,508 males of militia age. The organized portion of the militia is known as the West Virginia National Guard, and numbered in 1904, 1,545 men. There is a brigade of two regiments under the command of a brigadier-general who has a full brigade staff. The governor is commander-in-chief and appoints the general staff. The law provides for the organization of a battery of artillery, a signal corps, and a medical department. The organized militia is supported

by appropriations from the United States and the State governments. Arms, uniforms, and equipment, and armories are provided. The national guard is subject to ten days' camp duty per year and is paid for that time.

Government.—The governor, auditor, treasurer, secretary of state, attorney-general, and superintendent of Free Schools, constitute the executive of West Virginia. All the officials above named except the attorney-general are obliged to reside at the capital. All are elected every four years. Each of the above officials reports in writing to the governor ten days before the meeting of the legislature. The governor must have resided in the State five years and must be at least 30 years of age. In case of a vacancy in the governorship within the first three years after election a new election is held. If the remainder of the term is less than one year the president of the senate acts as governor, and after him the speaker of the house is eligible. The salaries paid have been after 1904 as follows: governor \$5,000; secretary of state, \$4,000, in addition to fees amounting to about \$15,000, superintendent of free schools, \$3,000, treasurer, \$2,500; auditor, \$1,500 and fees, amounting to about \$20,000, the attorney-general, \$2,500 and fees. The auditor is not only comptroller of the currency but is also register of the land office and commissioner of insurance. Other State officials are the State librarian, the adjutant-general, the commissioner of banking, the State geologist, the secretary of the board of agriculture, the commissioner of labor, the five mine inspectors, the game and fish warden, and there are the following boards and bureaus: Geological Survey, State Board of Examiners for Teachers, State Board of Agriculture, Board of Dental Examiners, State Board of Health, the State Board of Embalmers, and the Board of Public Works which is composed of the governor, auditor, treasurer, superintendent of schools, attorney-general, and the secretary of state. This board cares for the interests of the State in matters relating to internal improvements. The elections for State officials are held at the time of the presidential election and the new officials take office on 4 March of the next year. The legislature meets biennially in January of the odd numbered years and may remain in session not more than 45 days. Half of the senators are elected every two years, and all of the members of the House of Delegates. There are 15 senatorial districts, each sending two senators to Charleston. A senator must be at least 25 years of age, but only voting qualifications are required of a delegate. The pay is \$4 per diem and mileage. Of the 30 senators, 25 are Republicans, and of the 86 delegates, 59 are Republicans, a majority on joint ballot of 30 for the Republicans. There is no pocket veto and a simple majority suffices to override the governor's veto; after five days a bill may become a law without his approval. The legislature is prohibited from anything except general legislation. The State is divided into five congressional districts, which are all represented in Congress by Republicans, and both senators are Republicans. The judiciary is composed of (1) the supreme court of appeals; (2) 18 circuit courts; (3) 8 courts of limited jurisdiction; (4) the courts of county commissioners; (5) justices of the peace; (6) city courts.

WEST VIRGINIA

The supreme court is composed of 5 judges elected for 12 years, and holds session once a year at Charleston, Wheeling, and Charles Town. The judges are paid \$4,500 and mileage. There are 18 circuit judges for 18 circuit courts; they are paid \$3,300 and mileage. A circuit court is held four times a year in each county. The constitution prohibits any change in the judicial system oftener than once in eight years. The rapid development of some parts of the State rendered more courts necessary, so the legislature created nine (now eight) courts of limited jurisdiction with appeal to the circuit courts. Each county is divided into from three to ten magisterial districts, and each district elects one justice of the peace, or two if the population is greater than 1,200. These justices have the usual powers of American justices of the peace, and jurisdiction over civil suits involving \$300 or less. The county court is not a common law court, and not a court of record, but rather an administrative board for county affairs. There are no chancery courts, but the courts of record have equity jurisdiction; in equity cases the trial court may appoint four commissioners in chancery who decide such questions as the court refers to them and upon their decisions and reports the judge bases his decrees. Notaries public and commissioners are appointed by the governor without limit as to number. The unit of local government is the county under the usual elective county officers: county commissioners, sheriff, clerk, tax assessor, surveyor, etc. The township system was adopted in 1863 but did not work satisfactorily, and in 1872 was abolished and the old county system revived. Each county is divided into magisterial districts corresponding to the beat, precinct, or township of the southwestern States. No State official may accept a pass from a railroad company for himself or family.

History and Politics—The region now embraced in West Virginia was first explored by Abraham Wood in 1671. Governor Spotswood came over the mountains in 1716, and to celebrate the crossing his party drank 11 different kinds of wine in what is now Pendleton County, and in 1725 John Van Meter explored the valley of the South Branch. In 1727 Morgan Morgan built the first cabin in what is now Berkeley County. After 1735 the South Branch Valley began to fill up with the overflow from the Shenandoah Valley and from Pennsylvania and Maryland. The settlers were of several nationalities—and the composition of the people of West Virginia has always been different from that of the country east of the mountains. Some of the land in West Virginia was embraced in the "Northern Neck" grant to Lord Fairfax, and his surveyors in 1746 planted the Fairfax stone at the head of the North Branch of the Potomac to mark the western limits of the grant. In 1768, after the expulsion of the French who claimed the territory drained by the Ohio, the Six Nations sold the land to the English, though several other Indian tribes claimed the country. But within historic times no Indians have ever occupied any part of West Virginia. The attempts of the whites to take possession of these Indian lands led to bloody conflicts that lasted until after the Revolution. The West Virginians heartily supported the Revolution and

sent troops to help New England and the Middle Colonies. The history of western Virginia before 1861 is a history of controversy with eastern Virginia. Socially, politically and economically, the two sections of the State were unlike from the first. Western Virginia was democratic; eastern Virginia was aristocratic, in institutions. The idea of separation was older than the Union, the Continental Congress had been petitioned to set up a State west of the Alleghenies; the people of the West were always ready for independence. The western counties complained that they were governed for the benefit of the eastern counties. Unlike Tennessee and Kentucky, western Virginia had to wait half a century for separate State existence. The crisis came during the secession movement in 1861. The Virginia convention passed the ordinance of secession, the delegates from the western counties opposing, and submitted it to the people. From November 1860 to May 1861 meetings were held in the western counties which made it clear that that section would not go with the South. An irregular convention of 26 counties met in Wheeling, 13 May 1861, and came near breaking away before the vote on the ordinance of secession. The western counties voted 40,000 against and 4,000 for secession. The second Wheeling convention composed of the newly elected members of the legislature and irregularly elected delegates from the counties west of the mountains, met 11 June, declared the ordinance of secession void, vacated the offices of the State of Virginia, and formed a "reorganized" government of Virginia. The legislature, calling itself the Virginia legislature, elected senators for Virginia who were received at Washington. The convention made a provision for organizing a new State by calling a third convention at Wheeling on 26 November, in which 41 counties were represented. A constitution for the new State was formed and ratified by the people in April 1862. It was at first proposed to call the new State Kanawha, but the name West Virginia was finally adopted. The "Reorganized" government of "Virginia" gave its consent to the erection of the new State, and on 31 Dec. 1862, Congress consented to admit West Virginia to the Union as soon as it should provide for gradual abolition of slavery. On 19 June 1863, the State was admitted to the Union, and the long desired separation was effected. The movement was not caused by the war; the war simply gave an opportunity to secure long-desired independence. During the Civil War no important military operations were carried on in West Virginia. The Confederates early lost control of the State, but there were skirmishes and raids until near the end of the war. However, as compared with the other Southern States, West Virginia suffered little. From the State about 29,000 soldiers entered the Union army, and about 10,000 went into the Confederate. Laws were passed by the legislature confiscating the property of Confederates, and after the war all Confederates and Confederate sympathizers were disfranchised from voting and holding office. In 1869 it was officially reported that 29,316 persons,—nearly half of the voting population—were disfranchised. In the reaction against the Fourteenth Amendment, the Flick Amendment to the State Constitution, which combined white enfranchisement

WEST VIRGINIA CAMPAIGN OF 1861

with negro suffrage, was adopted. But before its adoption in 1871 the Democrats carried the State. Thus the liberal measures were proposed by the Republicans. The Democrats retained control of the State until 1897 when the Republicans carried the elections. The change in political complexion was due to the great industrial development of the State which attracted a heavy immigration from the States to the north and west. West Virginia was the first State to begin the undoing of reconstruction; and the first to break from the ranks of the "Solid South."

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West Virginia Campaign of 1861. At the outbreak of the Rebellion West Virginia had few slaves, no sympathy with the secession movement, and adhered to the Union. Her citizens denounced the action of the State convention in adopting an ordinance of secession, and at town and county meetings passed resolutions looking to a separation of the western counties from the rest and the organization of a new State. On 13 May 1861 a delegate convention was held at Wheeling, 26 counties being represented by nearly 400 leading Union men, and an interchange of views resulted in a decision to secede from the State should the ordinance of secession be ratified by the vote of the people to be given on the 23d of May, and a provisional convention was called to meet on 11 June following. The vote cast on 23 May was large and showed a majority against secession in the west. Out of a vote of about 44,000 in 50 counties 40,000 were against the ordinance of secession.

Meanwhile Gov. Letcher had called out the militia of West Virginia and ordered officers to protect the Baltimore & Ohio Railroad and guard the frontier of the State against invasion by Ohio and Pennsylvania. The principal officer assigned to this duty was Col. Geo. A. Porterfield, who, 4 May, was ordered by Gen. R. E. Lee to Grafton to call out the militia and enroll volunteers to protect the railroad and encourage secession sentiment. Five thousand men were thought ample for the purpose, but Porterfield could not raise a tenth of that number and troops had to be sent from the eastern part of the State. Gen. Lee had informed Porterfield that it was not intended to interfere with the peaceful use of the railroad, but Gov. Letcher, incensed at the overwhelming Union sentiment and the apathy of the citizens in volunteering, and moved also by the collection of Ohio troops on the border, ordered Porterfield to make a

descent on Wheeling, seize and carry away the arms sent there by the national government, and arm his men with them, and specially commanded that should troops of Ohio or Pennsylvania endeavor to pass over the railroad to destroy it and the bridges. To seize Wheeling was impossible with the few men at his disposal, but, convinced that the Ohio troops were on the eve of a movement eastward, Porterfield burned the bridges of the railroad between Farmington and Mannington. This action was immediately followed by the occupation of the railroad and contiguous country by loyal West Virginia, Ohio, and Indiana troops, under command of Gen. McClellan, who had been assigned to the command of a military department embracing Ohio, Indiana, Illinois and West Virginia. Upon the advance of these troops from Wheeling and Parkersburg on the 27th, Porterfield abandoned Grafton on the 28th and fell back to Philippi, from which place he was driven on 3 June to Beverly. (See PHILIPPI, ENGAGEMENT AT.) Gen. Garnett was sent to relieve Porterfield and took position at Rich Mountain and Laurel Hill. Col. John Pegram's detachment at Rich Mountain was attacked and defeated by McClellan, 11 July, many men were taken prisoners and the rest retreated over Cheat Mountain. McClellan pursued through Beverly and Huttonsville, seized the summit of Cheat Mountain and intrenched a part of his command on the main Staunton turnpike leading over the mountain. (See RICH MOUNTAIN, BATTLE OF.) Garnett, who was at Laurel Hill, abandoned his position on the night of the 11th and retreated northeast toward the Northwestern turnpike, was overtaken at Carrick's Ford, on Cheat River, on the 13th, was killed, and his command, making a rapid retreat reached the Northwestern turnpike and turning southward arrived at Monterey in a demoralized condition. There are but three routes across the mountains separating West Virginia from the Shenandoah Valley that are practicable for military operations: the Northwestern turnpike on the north; the Staunton and Parkersburg turnpike farther south, and the Kanawha turnpike leading past Gauley Bridge, still farther south. While McClellan was seizing the two first, a column under Gen. Cox was operating on the latter. At the time Gen. Garnett was sent to Rich Mountain, Gen. H. A. Wise was ordered to raise a force for the defense of the Kanawha Valley, and Gen. J. B. Floyd was directed to raise a brigade for service in southwestern Virginia. It had been McClellan's intention to conduct his campaign in West Virginia by way of the Kanawha Valley, but the gathering of the Confederates near Beverly determined him to proceed to that region and postpone his Kanawha campaign till northwestern Virginia should be cleared of the enemy. Later it was found that the presence of Wise in the Kanawha Valley menaced his flank and 2 July Gen. Cox, with a brigade, was ordered to cross the Ohio at Gallipolis and conduct a campaign against Wise, and on the 6th he was ordered to march on Charleston and Gauley Bridge. Cox crossed the Ohio, with about 3,000 men, drove in some of Wise's advanced detachments, and on 11 July moved up the Great Kanawha River in transports. The river was navigable for small steamers about 70 miles, to a point 10 or 12 miles above Charleston, the only important town of the region

WEST VIRGINIA CAMPAIGN OF 1861

which is at the confluence of the Kanawha and Elk rivers. On the evening of the 16th Cox reached the mouth of the Pocotaligo, a large creek which enters the Kanawha from the north, where he heard that some of Wise's forces were in position above the mouth of Scary Creek on the south side of the Kanawha, and about three miles distant. It was necessary to dislodge this force before he could proceed farther. Troops were landed on the south side of the river, on the 17th, and the position was attacked, but Cox's men were repulsed with a loss of 14 killed and 47 wounded. (See SCARY CREEK, ENGAGEMENT AT.) This check delayed Cox until he could get land transportation, which came up on the 23d, and the next day he advanced, took Charleston on the 25th, which Wise had hurriedly abandoned, and on the morning of the 26th reached Gauley Bridge. Wise retreating before him and not halting till he reached Greenbrier and the White Sulphur Springs, where he was joined by Gen. Floyd. The whole of West Virginia, with the gateways to the East were now in Union possession, but the Confederates did not let the possession go unchallenged and made efforts to recover the lost ground.

After the defeat and death of Gen. Garnett, Gen. W. W. Loring was ordered to the command of the Confederate forces in northwestern Virginia, and being strongly reinforced began preparations to retake Cheat Mountain. Before these preparations were completed, Gen. R. E. Lee was assigned to the command of all the Confederate forces in West Virginia, and early in August joined Loring at Valley Mountain, where he remained a month, making himself acquainted with the country, bringing up reinforcements and supplies, and elaborating a plan of campaign by which he proposed to break through the Alleghanies and recover the country west to the Ohio. His point of attack was the Union position covering Beverly and the road westward. McClellan had been called to Washington, leaving Gen. Rosecrans in command in West Virginia, and Gen. J. J. Reynolds had command of the Union troops holding intrenched positions at Cheat Mountain summit, Elk Water and Huttonsville. Two Confederate columns were sent by the Staunton road against Cheat Summit and one by the Lewisburg and Huntersville road against Elk Water. At the same time another column was ordered to pierce the line between Elk Water and Cheat Summit, a distance of eight miles through a trackless mountain forest, to gain the rear of both positions. The movement began on 11 September, a part of Lee's command succeeded in reaching the rear of the Union troops at the Summit, a part attacked by the Staunton road in front, and both were repulsed. The column sent against Elk Water appeared before that position but, upon the failure of the other columns made no attack, and on the 15th all the columns retired to their old positions. Lee was greatly disappointed and deeply mortified at his failure, and was under a cloud from which he did not emerge till after he had succeeded to the command of the Army of Northern Virginia, in June 1862. No further effort was made by the Confederates to regain the ground lost in the northwest, nor was a general Union advance attempted, but there were sharp encounters at Camp Bartow and

Camp Alleghany (qq.v.) both resulting in Confederate success.

Floyd and Wise, who had united forces near Lewisburg, moved forward in the middle of August to Sewell Mountain, and on the 23d Floyd crossed to the north side of Gauley River at Carnifax Ferry to flank Cox at Gauley Bridge and drive him down the Kanawha Valley to the Ohio. He attacked and defeated the 7th Ohio at Cross Lanes, on the 26th, and on 10 September was attacked by Gen. Rosecrans and that night recrossed the Gauley and retreated to Sewell Mountain (see CARNIFAX FERRY). After some delay Rosecrans advanced to the top of Big Sewell Mountain, 34 miles from Gauley Bridge and began skirmishing with the Confederates. Lee, with a part of Loring's command, joined Floyd on the 29 September and assumed command. The two opposing armies that lay opposite each other upon the crests of Big Sewell, separated by a deep gorge, were about equal in number, but each commander had exaggerated ideas of the strength of the other, and it was difficult for either to make an offensive move. Each was looking for weak points in his adversary's position, using extraordinary energy to feed the men and animals, and waiting for the rains to cease and the roads to dry. But the rains did not cease, there was an extraordinary rise in the waters and on the night of 5 October Rosecrans began to fall back and at the end of four days his brigades were in camp between Hawks' Nest and Gauley Bridge. When Lee discovered that Rosecrans had gone he ordered the cavalry to follow; when satisfied that he had gone clear to Gauley Bridge he began repairing the road from Sewell Mountain to Lewisburg, and projected a campaign for Floyd down the left bank of New River and then to the mouth of Loop creek, the head of navigation of the Kanawha to intercept Rosecrans' communications, while an effort was being made to press him in front. Floyd lost no time in preparing for the movement to drive Rosecrans from Gauley Bridge back to Charleston, probably to the banks of the Ohio. On 10 October he started and after a difficult march over mountain roads, crossed New River at Richmond Ferry, and toiled on over the Raleigh, Fayette and Kanawha turnpike, through Fayetteville, and on the 22d camped on Cotton Hill, five miles beyond Fayetteville, in the elbow south of the junction of the New and Gauley rivers. On the next day he wrote the Confederate Secretary of War that with a proper force he could dislodge Rosecrans from Gauley Bridge and drive him back to Clarksburg, with 10,000 additional men he would win the whole Kanawha Valley before the conclusion of the campaign. Meanwhile Lee had informed him that Loring's troops would march back to the Cheat region, and this settled the fact that he would have to measure strength with Cox unaided by any advance on the Lewisburg road. On 1 November he opened on Rosecrans with artillery. Rosecrans planned to capture him, and on the 12th Floyd retreated, narrowly escaping capture (see GAULEY BRIDGE). The campaign on the Kanawha, as in the Cheat region, was ended. The inclement weather rendered extended movements impracticable, and both Union and Confederates found ample employment in getting up supplies, maintaining the

WEST VIRGINIA UNIVERSITY — WESTALL

roads in condition, providing shelter and guarding against surprise. Scouting was restricted to narrow limits and the results were unimportant. But the campaign had been one of the greatest importance. The whole line of the Alleghenies, from the Pennsylvania border on the north and beyond the Kanawha on the south, was securely guarded against incursions from the east, and westward to the Ohio River, western Virginia was in the hands of the Union government. The political transformation of West Virginia kept pace with the military movements, finally resulting in a new State.

Consult: 'Official Records,' Vols. II, V.: The Century Company's 'Battles and Leaders of the Civil War,' Vol. I.; Cox, 'Military Reminiscences of the Civil War,' Vol. I.

E. A. CARMAN.

West Virginia University, the State university located at Morgantown, W. Va. In 1814 the Monongalia Academy was incorporated by the Virginia legislature and located at Morgantown; and for 50 years was the leading school in the western part of Virginia. In 1864 the provisions of the land grant act of 1862 were extended to the new State of West Virginia, and in 1867 the West Virginia Agricultural College was founded. The property of the Monongalia Academy was then transferred to this college, and the new institution opened in August 1867. In 1868 the name was changed to West Virginia University. It is open to women on equal terms with men. The university now comprises the following departments: (1) the College of Arts and Sciences, (2) the College of Engineering and Mechanic Arts; (3) the College of Agriculture; (4) the College of Law; (5) the College of Medicine; (6) the College of Veterinary Science; (7) the Summer School; (8) the School of Music; (9) the Commercial School; (10) the School of Fine Arts; (11) the School of Military Science and Tactics; (12) the three preparatory schools at Morgantown, Montgomery, and Keyser. In the College of Arts and Sciences two courses are offered, the classical and the scientific, leading to the degrees of A.B. and B.S. Certain studies are required, but both courses are very largely elective; the subjects of study arranged in three groups, language, science, and philosophy (including history and pedagogy). Each student is required to elect a major, nine courses in one group, a minor, six courses in another group, and a sub-minor, three courses in the remaining group; for the degree of B.S. the major must be in science. The degrees of A.M. and Ph.D. are conferred for graduate work. The curriculum includes history and principles of education, school administration, and the art of teaching. Courses in science and theory of music count toward the A.B. degree. The College of Engineering and Mechanic Arts offers four years' courses in civil, mechanical, and electrical engineering leading to the degrees of B.S.C.E., and B.S.M.E.; and graduate courses leading to the degrees of C.E. and M.E. The undergraduate courses include general culture subjects: class-room work is supplemented by practical field and shop work. There are also special courses in manual training for teachers, and in the mechanic arts for practical mechanics, electricians, etc. The College of Agriculture offers a four years' course leading to the degree of

B.S. in agriculture, a one year's course in agriculture, and winter courses of 12 weeks in agriculture, animal industry, horticulture, and poultry raising. A dairy course was added in 1903-4. The College of Law offers a two years' course leading to a diploma, and a four years' course leading to the degree of LL.B. The medical department is the College of Physicians and Surgeons of Baltimore, which is affiliated with the university; the course is four years; the first two years' work may be done at Morgantown or Baltimore, the last two years' work is done at Baltimore. The Woman's Medical College of Baltimore has also been affiliated with the university on the same terms. In the School of Military Science and Tactics, 225 State cadets are appointed and receive their equipment and tuition free; students of the university may join the cadet corps for military instruction. The military course is the same as that at West Point; the State cadets also take courses in other departments of the university. The College of Veterinary Science has its hospital and its clinical department in Pittsburg, Pa. The Commercial School offers a full two years' course, including electives in the College of Arts and Sciences and the preparatory school; and shorter courses in special subjects, open to students in other departments. The Summer School offers courses in the general college subjects, and also for Sunday-school workers, with a session of one week. The university is one of the institutions affiliated with the Central Oratorical League, a students' organization for the maintenance of a high standard in public speaking. There are also literary societies, a choral society, an athletic association, and a Farmers' Grange for the members of the College of Agriculture. The campus (50 acres) occupies a picturesque site bordering on the Monongahela River; the buildings include Woodburn Hall, Martin Hall, Science Hall, Commencement Hall, Mechanical Hall, the Library (completed 1903), the Armory and Drill Hall, and the Agricultural Experiment Station. The library contained, in 1910, 41,000 volumes; in addition to which there are the libraries of the College of Law and of the experiment station, and the Willey Library. The income is derived mostly from the land grant endowment, the national appropriation for agricultural colleges, and the State appropriation. The students in all departments in 1910 at Morgantown numbered 1,422; this does not include the preparatory schools at Keyser and Montgomery.

D. B. PURINGTON,

President.

West Wind Drift. See CURRENTS, OCEAN.

Westall, Richard, English painter: b. 1765; d. London 4 Dec. 1836. He was apprenticed in London to an engraver on silver in 1779; subsequently studied at the schools of the Royal Academy and began to practise his art in association with Thomas Laurence in Soho Square. Here he became very popular as an illustrator of books and for a single design in water colors sometimes received \$400 or \$500. He also painted historical subjects. His 'Elijah Restoring the Widow's Son to Life' was purchased for some \$2,250 by the directors of the British Institution; but his paintings in oil were not generally salable; his designs and

figures are monotonously conventional, although some of his scenes from peasant life are by no means destitute of freshness and charm. One of his last occupations was that of teaching drawing to Princess afterward Queen Victoria of England. His water color painting, 'Cassandra Prophesying the Fall of Troy,' is now in the South Kensington Museum; and his pictures in oil of 'Christ Crowned with Thorns' in All Souls' Church, Langham Place, London.

Westall, William, English novelist: b. White Ash, Lancashire, 7 Feb. 1834; d. 9 Sept. 1903. He was educated at the Liverpool High School, engaged in business and in journalism, and was foreign correspondent for the *London Times* and *Daily News*, traveling in North and South America and in the West Indies. He has been a prolific writer and among his publications are: 'Tales and Traditions of Saxony and Lusatia' (1877); 'In Tropic Seas' (1878); 'Harry Lohengrin' (1879); and 'The Old Factory' (1881); 'Red Rivington' (1882); 'A Queer Race'; 'A Phantom City.'

Westboro, Mass., town in Worcester County, on the Boston & Albany Railway, 12 miles east of Worcester, 32 miles west by south of Boston. It contains five churches, a public library with 12,000 volumes, the Westboro Insane Hospital, the Lyman Reform School, a savings bank, a national bank, a weekly newspaper, and numerous important manufacturing industries, the chief being those connected with straw and leather goods, boots and shoes, and automobiles. Westboro was settled about 1659, and at first known as Chauncy, but in 1717 it was incorporated under its present name. Pop. (1910) 5,446.

Westbrook, Maine, city in Cumberland County; on the Presumpscott River, and on branches of the Boston & Maine and the Maine R.R.'s; six miles northwest of Portland. Electric lines extend to Portland. The river furnishes considerable water-power, which is utilized by manufacturing, chief of which are silk and cotton mills, paper and flour mills, and machine shops. The silk and cotton products are mainly dress goods, cotton warp, and seamless bags. In 1900 (government census) Westbrook had 42 manufacturing establishments, which were capitalized for \$3,950,221, and in which were 1,405 employees. The raw material cost annually \$1,372,166, and the finished products were valued at \$2,851,660. The bank has a capital of \$50,000, and, in 1903, had \$396,760 in deposits. The city has eight churches, the Presentation Convent, a high school, public and parish elementary schools, and the Walker Memorial Library. Pop. (1890) 6,632; (1900) 7,283; (1910) 8,281.

Westbury, Richard Bethell, BARON, English jurist and statesman: b. Bradford-on-Avon, Wiltshire, 30 June 1800; d. London 20 July 1873. Graduated from Oxford in 1818, he was admitted to the bar at the Middle Temple in 1833, in 1852 became solicitor-general, and in 1856-8 was attorney-general under Lord Palmerston. This post he held a second time, in 1859-61, and in 1861 he became lord-chancellor. As chancellor he did much by his decisions to aid the development of British equity jurisprudence, especially so in joint stock-company law, ecclesiastical appeals, and patent law.

Westcott, west'kôt, Brooke Foss, English bishop and theologian: b. Birmingham January 1825; d. Bishop Auckland 27 July 1901. He was graduated from Trinity College, Cambridge, in 1848, was elected a fellow of his college in 1849, and in 1851 was ordained in the English Church. He was assistant master at Harrow 1852-69, and here he remained till 1869, when he became a residentiary canon of Peterborough. He became canon of Westminster in 1883, and on the death of his friend Lightfoot, bishop of Durham, was appointed his successor in 1890, and in this see he remained till his death. He showed a deep interest in the lot of the miners in his diocese, which won him their genuine esteem, and he was very successful in preventing and settling industrial disputes. From 1870 to 1890 he was regius professor of divinity at Cambridge, and during his tenure of the office exercised a powerful and abiding influence on undergraduates and scholars. As a scholar and theologian Westcott's position was a very high one. As a textual critic he is best known for his share in the revision of the Greek text of the New Testament, which occupied him and J. F. A. Hort for 28 years, and resulted in the publication of their important work, 'The New Testament in the Original Greek,' in 1881. The text formed the basis of the Revised Version of the New Testament. His other published works include among others: 'General Survey of the History of the Canon of the New Testament During the First Four Centuries' (1855), a standard work which has gone through many editions; 'Introduction to the Study of the Gospels' (1860), another work of much value which has gone through numerous editions; 'A General View of the History of the English Bible' (1868); 'The Paragraph Psalter' (1879); 'The Revelation of the Risen Lord' (1882); 'Christus Consummator: Some Aspects of the Work and Person of Christ in Relation to Modern Thought' (1886); 'Social Aspects of Christianity' (1887); 'Essays in the History of Religious Thought in the West' (1891), a work of profound and suggestive thought; 'The Gospel of Life' (1892); 'The Incarnation and Common Life' (1893); 'Lessons of the Revised Version of the New Testament' (3d ed., 1898); 'Christian Aspects of Life' (2d ed., 1897); 'Lessons from Work' (1901); and 'Words of Faith and Hope' (1902). He was one of the New Testament revision company. Consult 'Life,' by his son (1903).

Westcott, Edward Noyes, American novelist: b. Syracuse, N. Y., 27 Sept. 1847; d. there 31 March 1898. He was a banker in his native city, but compelled to retire because of failing health, spent the winter of 1895-6 in Italy and in the latter year completed the novel 'David Harum,' which he had begun soon after his retirement from business. It was declined by many leading publishers, but when issued in the autumn of 1898, six months after the author's death, became at once a success, reaching a sale of 400,000 copies in a little more than a year. The construction of the novel is weak, but it is a faithful reflection of certain phases of life in central New York, and its humor is undeniable.

Westerly, R. I., town in Washington County; on the Pawcatuck River, and on the

New York, New Haven & Hartford Railroad. It is in the southwestern part of the State, near Long Island Sound. The Indian name, which for a time was retained by the white settlers, was Misquamicut. On 14 May 1669 the town was incorporated, under its present name. In 1686 the name was changed to Haversham, and in 1689 it was re-named Westerlo. The town contains five villages, each with its own post-office. Noyes' Beach and Watch Hill are favorite summer resorts. The chief manufacturing establishments are cotton and woolen mills. The granite quarries of the town are known for the quality and amount of their products. There are six banks; the three savings banks have deposits amounting to about \$4,500,000. Pop. (1910) 8,696.

Western Australia, one of the States of the new Commonwealth of Australia. See AUSTRALIA, WESTERN.

Western College, located at Toledo, Iowa. It was founded by the Iowa Conference of the United Brethren in Christ; was incorporated in 1856; and was opened to students in 1857. It was first located at Western, Linn County, but was moved to Toledo in 1881. In 1889 the main building was destroyed by fire, but was immediately rebuilt. The board of trustees consists of representatives of the alumni and of five conferences of the United Brethren, and three members-at-large. The college is open to men and women on equal terms. Two regular college courses are offered, the classical and the scientific, and the degrees of A.B. and B.S. are conferred. Both courses are almost entirely elective in the last two years, the list of electives differing in the two courses. In addition to the collegiate department, there are the Academic or Preparatory School, the Conservatory of Music, the College of Commerce, the School of Elocution and Oratory, and the Department of Art. Graduates from the collegiate courses are admitted to the senior year of Yale, Chicago, and Smith without examination. The buildings include the main building, the Bright Conservatory of Music, Mary Beatty Hall (the dormitory for young women, Drury Hall (the young men's dormitory), and the College Church. For several years a movement has been under way to secure an endowment fund of \$150,000. The library in 1909 contained 7,000 volumes; the students numbered 154, and the faculty 18.

Western Empire, The, the western portion of the Roman Empire, consisting of Italy, Illyricum, Spain, Gaul, Britain, and Africa, as distinguished from the Eastern or Byzantine Empire, comprising the eastern half of the Balkan Peninsula, Greece, Egypt, Syria, and Asia Minor, so far as Persia. This partition of the Roman Empire occurred in 364 when Valentinian I. shared the imperial authority with his brother Valens, who ruled in Constantinople as Emperor of the East, while Valentinian ruled in Rome as Emperor of the West. The partition became final in 395 when Theodosius the Great divided the Roman world between his two sons Honorius, who became Emperor of Rome and the West, and Arcadius, who became Emperor of Constantinople and the East. The Western Empire terminated in 476. See BYZANTINE EMPIRE: ROMAN.

Western Federation of Miners, an organization including all workers in and around

mines, mills, and smelters, for the improvement of their industrial and social condition. The Federation opposes the truck system, child labor, contract labor, and the use of the injunction in strikes, and has made special endeavor to obtain the eight-hour day for all workers. The executive officers are a president, a treasurer, and a secretary; there is also an organizer for each district (six in 1904); and these officers constitute the executive board. The Federation holds annual conventions and also provides for referring questions of policy and government to a referendum vote of the members. The executive board must approve every strike before it receives the support of the union. The Federation is a radical and militant organization, it endorses Socialism, and political action by workingmen. Its motto, which appears on the back of every union membership card, is "Labor produces all wealth: wealth belongs to the producers thereof." Its official organ is the "Miners' Magazine." It was organized in 1893, and took the lead in the organization of the American Labor Union with which it is now affiliated. (See LABOR UNION, THE AMERICAN.) In 1894 it conducted a strike in the Cripple Creek region; considerable violence occurred and the militia was called out, but the strike was settled largely to the Federation's advantage. In 1899 it became involved in another large strike, in the Cœur d'Alene mines; a number of riots, the most serious on 29 April, resulted in martial law being declared, the county officers being very generally in sympathy with the strikers. Large numbers of the striking miners were arrested and imprisoned in a temporary prison or stockade, called the "bull pen." Men were found to take their places to some extent, and the strike was a failure. Since that time, however, the Federation has grown in numbers and in influence; it has succeeded in unionizing the majority of the mines of the Western States, and has gained a considerable amount of political control in the mining towns. In 1904 a large strike was inaugurated in the Cripple Creek region, the immediate cause being certain mine owners' discrimination against union men. The mine owners were joined by an association of business men, known as the Citizens' Alliance, whose express purpose is the destruction of the miners' organization; some violence was committed, and the situation became so serious that the governor of Colorado declared martial law. Under this law, miners were imprisoned or deported in large numbers from the vicinity of the mines. Some of the mines returned to work, but with a reduced force, or under such difficulties that they were again forced to suspend and the Federation will not admit defeat.

Western Islands. See AZORES; HEIMTUS.

Western Maryland College, located at Westminster, Md. It was founded under the auspices of the Methodist Protestant Church, and was first opened to students in 1867. It was the first college in the South to offer equal educational privileges to both sexes; but it is not strictly co-educational, as there are separate classes for women, though they are taught by the same instructors and have practically the same courses of study as the men. The courses of study are arranged in three groups, which are practically the same in the first two years, but differ in the last two, and in accordance with

the predominating study are known as the classical, the scientific, and the historical. The degree of A. B. is conferred for the completion of a four years' course in any of these groups. In addition, courses are offered in music, art, and elocution, and students who complete one of these courses may substitute it for certain studies of the Junior year. There is also a preparatory school which in 1899 was established in a separate building (Levine Hall) a short distance from the campus. There are two State scholarships for each senatorial district. The campus contains 14 acres situated on elevated ground in the western part of the city. The main building consists of a central part, the original building, and five wings: (1) Owings Hall, extending back from the central part, (2) Smith Hall, extending to the east; (3) Hering Hall, extending to the west; (4) Ward Hall, a rear extension of Hering Hall; and (5) a rear extension of Smith Hall. Other buildings are the Yingling Gymnasium, Y. M. C. A. Hall, Baker Chapel, built of white stone, and Alumni Hall, containing a large assembly room, the halls of the literary societies, etc. The students in 1910 numbered 222, and the faculty 20.

Western Reserve, or Connecticut Reserve, that portion of the Northwest Territory (q.v.) reserved by Connecticut when, in 1786, that State ceded to the United States other parts of the territory claimed under the charter of 1662, which granted to Connecticut lands limited east and west by the sea. This section of land is what is now included in the northeastern part of Ohio; it was all the territory between lat. 41° and 42° 2' N., and extending 120 miles from the western boundary of Pennsylvania. In 1795-6 Connecticut sold this land, except 300,000 acres, to a number of men who established what was known as the Connecticut Land Company. At first settlers hesitated about purchasing any of the land on the "Reserve," fearing the validity of the title, but when the State of Connecticut yielded all claim to the government, there was no longer any doubt about the title. There were a large number of colonists from Connecticut who settled on this "Reserve," counties were organized, 13 in all, which were in whole or in part from lands of the "Reserve." (See *Nowalk, Ohio*.) The people were characterized by their thrift, industry, and the manner in which they established schools. A large part of the money received by Connecticut, for the sale of the lands, was set aside "as a perpetual fund, the interest of which should be appropriated to the support of schools." This school fund was the means of influencing in Ohio a unique system of education, in some respects different from that of any other State. Consult Matthews, 'Ohio and Her Western Reserve' (1902).

Western Reserve University, located at Cleveland, Ohio, includes the College for Women, the Graduate School, the Medical School, the Law School, the Dental School, and the Library School. As a working, though not a corporate, part of Western Reserve University is Adelbert College of Western Reserve University. Adelbert College of Western Reserve University was founded as Western Reserve College in Hudson, 26 miles from Cleveland, in 1826. As the territory formerly belonged to Connecticut, and derived its name from being territory in the West reserved for special pur-

poses, so also the influence of Connecticut's great college dominated in its establishment and during its first decades. In affiliation with the college at Hudson for many years was the Cleveland Medical School. Theological instruction was also given for many years, ceasing in 1853. In 1882 Western Reserve College was moved to Cleveland. Amasa Stone (q.v.) gave to the college the sum of \$600,000. In recognition of the gift the college took the name of a beloved son of Mr. Stone, who died while a student at Yale, becoming Adelbert College of Western Reserve University. Subsequent gifts and bequests, together with gifts made by members of his family, have amounted to more than \$1,100,000. In 1884 a university charter was obtained. The following departments, in addition to the Medical School, were established. In 1888 the College for Women, in 1892 the Dental School, the Law School and the Graduate School, and in 1903 the Library School. The Library School was endowed by a gift of \$100,000 made by Andrew Carnegie.

The college and the university have throughout their history been distinguished by a high type of scholarship. Among the professors have been Rev. Laurens Perscus Hickok, 1836-44; Rev. Clement Long, 1844-52; Nathan Perkins Seymour, 1840-70; Elias Loomis, 1836-44; Charles Augustus Young, 1856-66; Elijah Porter Barrows, 1837-52; Samuel St. John, 1838-52; Samuel Colcord Bartlett, 1846-52. Its presidents have been Charles Backus Storrs, 1830-33; George Edmond Pierce, 1834-55; Lawrence Hitchcock, 1855-71; Carroll Cutler, 1871-86; Hiram Collins Haydn, 1887-90; Charles Franklin Thwing, 1890—. The whole number of students in the different departments from the beginning has been as follows: Adelbert College, 2,091; College for Women, 750; the Graduate School, 150; the Medical School, 4,000; the Law School, 475; and the Dental School, 350. The buildings and equipment are valued at \$1,396,400 and the entire property at \$2,834,300.

In the general educational endeavor known as Western Reserve University are two administrative features of special significance. One lies in the co-ordinate method of education. A college for men, Adelbert College, and a college for women exist as essential members of the same university. Each has its own faculty and government. The two bodies of students are distinct. Each college has its endowment and buildings. The work in the sciences, however, is done in the same laboratories, but usually at different times. Professors in the same departments of the two institutions exchange courses of instruction to a certain extent. The co-ordinate method is in part a co-operative method. In a State and a part of the country noted for co-education, the method prevailing in Western Reserve University is conspicuously successful. A further significant method of administration relates to the co-operative course of study established between the Case School of Applied Science and Adelbert College. These two institutions are planted upon the same campus and each has its own board of trustees. But the two faculties have arranged a course of instruction covering five years, three of which are spent in pursuing the liberal studies of the undergraduate college (Adelbert College) and the last two years are spent in the technical school (Case School of Applied Science). At the conclusion

WESTERN UNIVERSITY OF PENNSYLVANIA — WESTFIELD

of the five-year course a bachelor of arts and a bachelor of science degree are given. Thus, the advantages of the liberal course of study are conserved and the efficiency of the specialized course also gained. **CHARLES F. TRWING,**
President.

Western University of Pennsylvania, located at Allegheny, Pa., with its professional schools at Pittsburg. It was founded in 1786 and chartered in 1787, thus being the second oldest institution of learning west of the Appalachian Mountains. In 1819 its curriculum was extended, and the name changed to Western University of Pennsylvania. At first it was located at Pittsburg, and the building was destroyed in the fire of 1845; a new building was erected, but also destroyed by fire in 1849; and the university was compelled to suspend work for five years. Since that time, it has largely increased its endowment and has been uniformly prosperous. In 1895 all courses of the university were opened to women. The university now includes the following departments: (1) the Collegiate Department; (2) the Engineering Department; (3) the Western Pennsylvania School of Mines and Mining Engineering; (4) the Allegheny Observatory; (5) the Pittsburg Law School; (6) the Western Pennsylvania Medical College; (7) the Pittsburg College of Pharmacy; (8) the Pittsburg Dental College. The Collegiate Department offers three courses, the classical, the Latin-scientific, and the scientific; the degree of B.S. is conferred on the completion of the scientific course, the degree of A.B. for the other two courses. Nearly all of the work in the last two years of the classical, scientific, and Latin-scientific courses is elective. A special course providing more thorough and continuous work in chemistry is open to scientific students. The degrees of A.M. and M.S. are conferred for graduate work. The Engineering Department offers three courses, civil, mechanical, and electrical engineering; the School of Mines offers a course in mining engineering; the degrees of civil engineer, mechanical engineer, electrical engineer, and mining engineer are conferred. The work of the first two years of the course in mining engineering is the same as that of the course in mechanical engineering. The School of Mines was established as a department of the university in 1895, when the State legislature appropriated \$50,000 for that purpose. The Allegheny Observatory was founded in 1859 by the Allegheny Astronomical Society; and in 1867 with the other property of that society was transferred to the University; its chief function is the promotion of original research, and the providing of graduate work. The Department of Law offers a three years' course, on the completion of which the degree of LL.B. is conferred. The Medical Department confers the degree of M.D. for a four years' course; the Reineman hospital is under university control, and other hospitals offer opportunities for clinical work. The College of Pharmacy offers a two years' course leading to the degree of graduate in pharmacy, and in addition an advanced third year course, graduates of which are entitled to the degree of doctor of pharmacy; the degree of pharmaceutical chemist is conferred for the completion of three terms' work. The course in the Dental College is three years in length, and leads

to the degree of D.D.S. There are several endowed scholarships in the Collegiate and Engineering departments, 12 of which are for colored students, and three for descendants of members of the Grand Army of the Republic; there are also a number of high school scholarships for honor students in accredited high schools. The students maintain a literary society, an athletic association, an electrical club, and glee and mandolin clubs. The Collegiate Department, the Engineering Department and School of Mines are located at Allegheny; the Observatory at Riverview Park, Allegheny, in buildings erected in 1902; the other departments are in the city of Pittsburg; the medical department has a clinical building, erected 1897, known as the Emma Kaufmann Clinic. The library contains approximately 25,000 volumes, including the Robert Watson Library, and the departmental libraries; in addition, the Carnegie libraries of Allegheny and Pittsburg are open to students, and the Allegheny County Law Library to law students. The students number nearly 800, distributed about as follows: College and Engineering, 150, Medical 270, Dentistry 140, Pharmacy 130, Law 100. The faculty, including assistants and demonstrators, numbers about 144. The University is planning a new location in the eastern part of Pittsburg on which will be gathered all the departments of the institution.

S. B. MCCORMICK,
Chancellor

Westfield, Mass., town in Hampden County; on the Westfield River, and on the Boston & A. and the New York, N. H. & H. R.R.'s; nine miles west of Springfield. The chief manufacturing establishments are machine-shops, paper mills, thread mills, bicycle and whip factories, and cigar factories. In 1900 (government census) the town had 186 manufacturing concerns, capitalized for \$4,345,372 and employing 2,641 persons, to whom were paid annually \$1,229,643. The total cost of raw material used annually was \$2,401,460, and the value of the yearly products was \$5,072,074. From 1900 to 1904 there has been considerable increase in the amount of productions. The valley in which Westfield is located is noted for its beauty; the town has a park, Woronoco, an excellent water-supply, which is brought from Montgomery Mountain, seven miles distant, and a good sewerage system. The water plant, completed in 1874, cost nearly \$250,000. There are seven churches, the Massachusetts State Normal School, a public high school, established in 1855, public and parish elementary schools, kindergartens, and a public library, which contains nearly 20,000 volumes. There are four banks; the two national banks have a combined capital of \$400,000; the two savings banks have (1903) deposits amounting to \$3,600,890.

Westfield is on the site of an Indian village which was called Woronoco. Pop. (1910) 16,044.

Westfield, N. J., village in Union County; on the Central Railroad of New Jersey; about 20 miles southwest of New York. It is mainly a residential village, in a beautiful location, on an elevation. The roads leading out into the country places are excellent. There are six churches, public and private schools, and a national bank. Pop. (1910) 6,430.

WESTFIELD—WESTMACOTT

Westfield, N. Y., village in Chautauqua County; on the Chautauqua Creek, and on the New York, C. & St. L. and the Lake Shore & M. S. R.R.'s; about 60 miles southwest of Buffalo, and 20 miles southwest of Dunkirk. It is in an agricultural and fruit region, in which the chief products are grapes, apples, peaches, and pears. It has railroad shops, a grist-mill, and fruit-basket and crate factories. There are six churches, a union school and academy, which has two endowed scholarships, and a public library, founded by Hannah Patterson by a gift of \$100,000. There is a national bank with a capital of \$50,000. Pop. (1890) 1,983; (1900) 2,430; (1910) 2,985.

Westfield College, located at Westfield, Ill. It was founded in 1861 under the auspices of the United Brethren. It confers the degree of A.B. for the completion of the four years' college course. In addition to the degree course there are normal and business courses and a preparatory department. In 1910 the grounds and buildings were valued at over \$50,000. The income is derived mainly from tuition and incidental fees. In 1910 the library contained over 3,000 volumes, the students numbered 150, and the faculty 9.

Westford, Mass., town in Middlesex County; on the Boston & Maine Railway, 6 miles southwest of Lowell. It contains several villages, and has four churches and a public library. There are manufactures of woolen goods and machinery, and agriculture and granite-quarrying are carried on. Pop. (1910) 2,851.

Westinghouse, George, American inventor: b. Central Bridge, N. Y., 6 Oct. 1846. He entered the machine shop of his father, a manufacturer of agricultural implements, when very young and early evinced an inventive genius, designing at 15 a rotary engine. He served in the Union army in 1863-4, and in 1864-5 was assistant engineer in the United States navy, after which he studied at Union College for two years. He continued his interest in mechanics, his first invention of importance being a railway frog. In 1866 he introduced the famous Westinghouse brake (see AIR-BRAKE), which he has since developed to a remarkable degree of efficiency, and which has come into international use. He was one of the pioneers in introducing alternating-current machinery, and he succeeded in securing the use of this method at the Chicago Exposition in 1893. He has also made numerous improvements in railroad signaling, and through his devices the safety of high-speed railway traveling has been greatly increased. He has erected extensive works in this country and abroad for the manufacture of his various inventions, and is president of numerous corporations. He received the Order of Leopold from the Belgian king in 1884, and in 1889 the Royal Order of the Crown from the king of Italy. He was also decorated with the French Legion of Honor.

Westlake, William, American inventor: b. Cornwall, England, 23 July 1831; d. Brooklyn, N. Y., 28 Dec. 1900. He came to the United States in 1847, settled in Milwaukee, Wis., and there was employed in a printing office. He was subsequently an apprentice to a tinsmith, and in 1853 made for Captain John Ericsson the models for his first hot-air engine. He entered the em-

ploy of the La Crosse & Milwaukee Railroad Company in 1857, and soon after began the series of inventions which made him famous. Among them are the Westlake car heater, the globe lantern, the first practical car lamp, the oil cook stove, the stoveboard, etc.

Westland, New Zealand, a provincial district in South Island, bounded north by Nelson district, south by Otago, west by the ocean, and east by Canterbury, from which it is separated by the chain of the Southern Alps. It is about 200 miles long and about 30 miles in average breadth, its area being about 4,642 square miles. It consists principally of hills branching off from the great alpine system, intersected by narrow bush-clad valleys, and merging coastward into undulating plateaus, river valleys, and shelving coasts. The rivers are numerous but short. Practically the whole of the district is covered with forest. Large tracts can be prepared easily for pastoral purposes, but there is little ground suitable for agriculture. Gold is found in the valleys of the rivers, especially in those of the Arahura and Waibo, and gold-bearing quartz is also worked in some places. Silver, copper, iron, and tin are among the other metallic treasures of the district, which has also yielded much coal, especially from the valley of the Grey. The climate is equable and temperate. This rainfall is heavy, and snow lies on the high mountains during much of the year. The capital is Hokitika, the other chief towns being Greymouth, Brunner, Kumara, and Ross. Railways connect Greymouth with Hokitika, Jackson, and Reefton (in Nelson district). Westland was formerly part of Canterbury district.

Westmacott, west'ma-kōt, Richard, English sculptor, son of Sir Richard Westmacott (q.v.): b. London 1799; d. there 19 April 1872. He studied under his father, and also in Italy 1820-6, and after returning to England rose to prominence in his art. In 1857 he succeeded his father as professor of sculpture at the Royal Academy, having become associate member of the Academy in 1838 and a full member in 1849. His style resembled that of his father in many respects. He published a 'Handbook of Sculpture' (1864) and a pamphlet 'On Coloring Statues.'

Westmacott, Sir Richard, English sculptor: b. London 1775; d. there 1 Sept. 1856. He was the son of Richard Westmacott, also a sculptor, and was early trained to a knowledge of art by his father. In 1793 he was sent to Rome to study his profession under Canova, and there gained the annual gold medal for sculpture given by the pope at the Academy of St. Luke. He also obtained a first prize for sculpture at Florence, and was elected a member of the Academy there. In 1798 he returned to England, and rose rapidly into estimation as an artist. Many of the monuments in St. Paul's Cathedral are by him, and that building forms, in some respects, a gallery of his works. The figure of a Welsh girl in a monument to the memory of Lord Penrhyn, at Penrhyn, in North Wales, is considered by many as his best creation. He designed also the statue of Nelson in Birmingham, besides figures of Addison, Pitt, and many others. He became an associate of the Royal Academy in 1805, a full member in 1811, and in 1827 succeeded Flaxman as lecturer to the Academy on sculpture. He was knighted in 1837.

WESTMINSTER—WESTMINSTER ASSEMBLY OF DIVINES

Westminster, London, England, a metropolitan borough, formerly the ancient City and Liberty of Westminster, which still retains its civic title and certain privileges. Area, 2,508 acres. It is bounded on the south and east by the river Thames; east by the city of London, from which it was separated by the former Temple Bar; north by Holborn, Marylebone, and Paddington; and west by Kensington and Chelsea. It is connected with Lambeth by Vauxhall, Lambeth, Westminster, and Waterloo bridges. The parliamentary borough of Westminster created by the act of 1885 is practically coterminous with the parish of Saint Margaret and Saint John the Evangelist, the remainder of the city constituting the parliamentary boroughs of Saint George, Hanover Square, and the Strand. The city contains some of the finest and most imposing buildings in London, and teems with historical and literary associations. All the metropolitan royal palaces are within its limits, and also Westminster Abbey, the Houses of Parliament, a fine modern Roman Catholic cathedral, the principal government buildings, the headquarters of the London county council and the metropolitan police force, the National Gallery, and the Tate Gallery, Burlington House, Somerset House, and the new Caxton Hall, and the principal theatres and opera-houses.

The history of Westminster goes back to a very early period. It became a city when, in 1540, Henry VIII. made it the see of a bishop, and even though the see was suppressed ten years later it retained the right to the style of city. The only (Anglican) bishop of Westminster was Thomas Thirlby. Since 1831 a branch of the Grosvenor family has borne the title of marquis, and since 1874 of Duke of Westminster. In 1850 a Roman Catholic archiepiscopal see of Westminster was created by Pope Pius IX., the first occupant being Cardinal Wiseman. Pop. of city and metropolitan borough about 190,000. See LONDON.

Westminster, Md., city, county-seat of Carroll County; on the Western Maryland Railroad (Wabash System) about 35 miles northwest of Baltimore. Two new (1904) railroads are under consideration. The city is in an agricultural section, but it has considerable manufacturing interests. The chief industrial establishments are flour mills, carriage factories, canneries, and cigar factories. In the canning season about 500 employees are engaged in the canning factories. There are nine churches. The educational institutions are the Western Maryland College (Methodist Protestant), opened in 1868; public and parish schools. The three national and two savings banks have a combined capital of \$400,000, and deposits of over \$2,000,000. The government is vested in a mayor and the common council of Westminster. The council consists of five members, elected annually, the first Monday in May.

The place was settled in 1724 by persons from the north of Ireland and a colony of English from Prince George County, of which at that time it was a part. Some Germans were also among the first settlers. The inhabitants at present are nearly all American born, descendants of Germans, Irish, English, Dutch, and French. Pop. (1910) 3,310.

WILLIAM H. VANDERFORD,
Editorial Department, 'Democratic Advocate.'

Westminster Abbey. See LONDON, Church Buildings.

Westminster Assembly of Divines, a celebrated assembly held in the middle of the 17th century for the settlement of a general creed and form of worship throughout Great Britain, at a time when Presbyterianism had gained a strong position in England as well as in Scotland. On the 23d of November, 1641, the House of Commons (Long Parliament) addressed to the king a remonstrance desiring a synod of the most learned and pious men throughout the island for the settling of the government of the church; but it was not till 1643, after the civil war had begun, that an ordinance was passed (on 19 June) convoking the long-proposed assembly of divines. By this act 121 clergymen, with 10 lords and 20 commoners as lay assessors, were nominated as constituents of the assembly. Among the first were—the bishops of Exeter and Worcester, Drs. George Morley, John Hacket, William Nicholson, Edward Reynolds, and Robert Sanderson, afterward bishops respectively of Winchester, Lichfield, Gloucester, Norwich, and Lincoln; Dr. James Ussher, archbishop of Armagh; Edmund Calamy, John Lightfoot, Cornelius Burges, Thomas Twisse (prolocutor), and numerous other distinguished divines of the Calvinistic or Puritan party. The lay members comprised John Selden, the two Sir Harry Vanes (father and son), Oliver Saint John, John Pym, and other noted adherents of the popular cause. The assembly commenced its sittings on 1 July 1643, in Henry VII.'s chapel, at Westminster Abbey, but in the meantime a proclamation forbidding the assembly to meet had been issued by the king on 2 June, which had the effect of inducing the greater part of the Episcopal members to absent themselves, and Episcopacy was thus almost entirely unrepresented. The majority of those who remained were Presbyterians, but there was a powerful and energetic minority of Independents. A deputation was now sent along with commissioners from the English Parliament to the general assembly of the Scottish Church and the Scottish Convention of Estates, soliciting their co-operation in the proceedings of the Westminster Assembly, and accordingly on 15 September four Scottish clergymen, Alexander Henderson, George Gillespie, Samuel Rutherford, and Robert Baillie, with two laymen, Lord Maitland and Sir Archibald Johnston of Warriston, were admitted to seats and votes by an act of the English legislature. The assembly continued to hold its sittings till 22 Feb. 1649. Among the results of its deliberations were the directory of public worship, which was presented to Parliament on 20 April and ratified on 2 Oct. 1644; the Confession of Faith presented to Parliament in October and November, 1646, and ratified, with a few verbal alterations, in March, 1648; the Shorter Catechism, presented to the House of Commons on 5 Nov. 1647, and the Longer Catechism on 15 Sept. 1648. In the latter period of the sittings of the assembly the growing power of the Independent party in Parliament presented a serious obstacle to the carrying into effect of its recommendations, though in 1648 an order of Parliament was pronounced declaring "all parishes and places whatsoever," with the exception of chapels for the king and peers, to be under the Presbyterian form of church government. The accession of

WESTMINSTER COLLEGE—WESTON

Cromwell to power destroyed the hopes of the Presbyterians, and on the Restoration the whole proceedings of the Westminster Assembly, with the ratifications of Parliament, were annulled as invalid.

While this celebrated convocation was thus allowed, as regards England, to remain almost inoperative, its deliberations have left on Scotland and on Presbyterianism as established in the United States, an impress which will never be effaced. The present standards of the Presbyterian churches are made up of the various formularies above enumerated. They were ratified by the Scottish General Assembly, as follows: The Directory of Public Worship in February, 1645; the Confession of Faith in August, 1647; and the Longer and Shorter Catechism, in July, 1648. Consult: Hetherington's 'History of the Westminster Assembly' (1843; 6th ed., 1891); the 'Minutes of the Assembly,' edited by Mitchell and Struthers (1874); Mitchell's 'The Westminster Assembly' (1893); etc. See **PRESBYTERIANISM**.

Westminster College, located at Fulton, Mo. It was founded in 1853 by the Missouri Synod of the Presbyterian Church. Though badly crippled during the Civil War by reduction in numbers and loss of endowment, the college continued its work throughout the war. In 1892 a bequest of nearly \$120,000 for permanent endowment was received, and in 1897 the Alumni Association began a movement for further increase of this fund. In 1901 an amendment of the charter placed the college under the joint control of the Southern and the Northern synods of Missouri. The college formerly conferred the three degrees of A.B., B.L., and B.S. for the completion of the classical, literary, and scientific courses respectively; but recently arranged its course in three groups corresponding to the former three courses, and confers the single degree of A.B. Each group includes required and elective studies. Bible study is required, and Hebrew is among the electives. There is also an academy offering a classical and a literary and scientific course and commercial courses. The campus comprises 18 acres on a wooded slope bordering on Stinson Creek. There are now four buildings. In 1910 the library contained 7,000 volumes, the students numbered 175 and the faculty 12.

Westminster College, located at New Wilmington, Pa. It was chartered in 1852, as Westminster Collegiate Institute under the auspices of the United Presbyterian Church. The board of trustees now consists of 40 members, the majority of whom are elected by two synods of that church. The name was changed to Westminster College in 1892. The college offers two four years' courses leading to degrees, the classical and the scientific, and confers the degrees of A.B. and B.S. The work of the scientific course is mostly required; that of the classical course largely elective in the junior and senior years. Greek is required for the A.B. degree. There are also a three years' preparatory course, a department of music, and an art department. The students maintain four literary societies. Any student taking more than one study of the classical course is required to belong to one of these societies. There is no general athletic association, but a football association, baseball association, etc. The college has a pleasant situation on

elevated ground, some parts of the campus commanding a fine view. The buildings are the main building, science hall, the ladies' hall, and the gymnasium. In 1902 a commission was organized by the synods in control for the raising of a semi-centennial endowment fund. The students in 1910 numbered 274, of whom 173 were in the collegiate courses; the faculty numbered 10.

Westminster Hall. See **LONDON, Houses of Parliament**.

Westminster, Order of the Holy Cross of. See **ORDERS, RELIGIOUS**.

Westminster Palace, London, England, an alternative name for the Houses of Parliament, perpetuated from the ancient palace built by Edward the Confessor as a royal residence, and which contained the various national administrative and judicial offices. With the exception of the great hall, the building was destroyed by fire in 1834. The site is occupied by the new palace of Westminster or Houses of Parliament. See **LONDON, Houses of Parliament**.

Westminster School, an ancient English public school established in Westminster Abbey by Henry VIII., and refounded in 1560 as Saint Peter's College by Queen Elizabeth. The school buildings closely adjoin the abbey, several of them having once been a part of the domestic buildings of the abbey, the great schoolroom being originally the monks' dormitory; others, such as Ashburnham House, belonging to the Post Reformation period. The institution was reorganized in 1868 as one of the seven principal public schools of England. The Westminster play, for which this school is noted, is a yearly performance by the pupils of some Latin comedy. Many eminent Englishmen have been educated at this school. Consult: Forshall, 'Westminster School, Past and Present' (1884); Barker and Stenning, 'Westminster School Register' (1893).

Westminster Standards. See **PRESBYTERIANISM**.

Weston, Edward, American electrician: b. London, England, 9 May 1850. He came to the United States in 1870 and engaged as chemist to a nickel-plating company. He devised various improvements in the process of nickel-plating, and invented several dynamo-electric machines, establishing at Newark, N. J., in 1875, the first factory in America devoted exclusively to the manufacture of the latter class of machines. After the consolidation of his plant with another company in 1881 he continued as its electrician until 1888. He has since devoted his attention to the improvement of appliances for lighting by electricity, and has introduced improvements in both arc and incandescent lighting. He was one of the founders of the American Institute of Electrical Engineers, of which he has been president since 1888.

Weston, W. Va., town, county-seat of Lewis County; on the West Fork of the Monongahela River, and on the West Virginia & Pittsburgh Railroad; about 78 miles south by east of Wheeling and 71 miles south by east of Parkersburg. It is in an agricultural region, in which considerable attention is given to stock-raising. It has a flour mill, lumber and planing mill, and machine shops. A State Hospital for the Insane is located here. The two banks have a combined capital of \$150,000. Pop. (1910) 2,780.

WESTPHALIA—WESTPORT

Westphalia, west-fäl'ä, or **Westfalen**, wĕst'fāl'ĕn, Germany, a name originally given (1) to a large region of Germany, (2) to a duchy; (3) to an ancient imperial circle; (4) to a kingdom; (5) to a province of Prussia. These various divisions will be described in the above order.

1. The name of Westphalia was given from the second half of the 8th century to the western part of the ancient Duchy of Saxony incorporated by Charlemagne in the kingdom of the Franks, that is, to all the country between the Weser and Rhine, while the territory between the Elbe and Weser was called Eastphalia (Ostfalen). The latter name was lost after the dissolution of the Duchy of Saxony in 1180; the former was retained, and was applied in the first place to a newly erected duchy.

2. *Duchy of Westphalia*.—This was formed out of the part of the old Duchy of Saxony, then and still called Süderland or Sauerland, on the Upper Ruhr and Lenne. When Henry the Lion, the last of the old dukes of Saxony, was put under the ban of the empire, this territory was taken possession of by Philip of Heinsberg, archbishop of Cologne, who obtained the title of duke from Frederick Barbarossa. Cologne remained in possession of it until the dissolution of the archbishopric in 1801, upon which it was given, by way of indemnity, to Hesse-Darmstadt. In 1813 it was ceded by this power to Prussia, and was united with the Prussian province of Westphalia.

3. *Circle of Westphalia*, one of the ten circles into which the Empire of Germany was divided by Maximilian I. in 1512. It comprised the region between Lower Saxony, the Netherlands, Thuringia, and Hesse, as well as considerable tracts on the left bank of the Rhine; but the proper Duchy of Westphalia, as an appendage of Cologne, was considered as belonging to the electoral circle of the Rhine. Its total area was 22,175 square miles.

4. *Kingdom of Westphalia*.—The Peace of Tilsit (July, 1807) had made Napoleon master of all the Prussian territory west of the Elbe, and he also kept possession of the territories of the electors of Hesse and Hanover, and the Duke of Brunswick. Out of the countries just mentioned he created by decree of 18 August 1807 a kingdom of Westphalia, with an area of 14,712 square miles, and a population of nearly 2,000,000. Napoleon gave the kingdom to his youngest brother Jerome, and on 15 Nov. 1807 a constitution similar to the French was granted to it. The insurrections that broke out in several parts in 1809 occasioned the adoption of various severe measures, and the introduction of an oppressive system of police. At the same time the king was required to bring his army up to a strength of 30,000 men, which produced great disorder in the finances. In 1810 a part of Hanover was added to the kingdom, the whole area of which was now 17,540 square miles. After the battle of Leipsic (1813) the kingdom was dissolved. On 26 October Jerome was obliged to quit his capital (Cassel) and make his escape from the kingdom, whereupon the territories of which it was composed returned to their former possessors.

5. *The Prussian Province of Westphalia* was formed in 1815 out of some of the provinces which Prussia formerly possessed in the circle of Westphalia. It is bounded on the north by the province of Hanover; on the east by Hanover,

Schaumburg-Lippe, Lippe-Deinold, Brunswick, Hesse-Nassau, and the principality of Waldeck; south by the province of Hesse-Nassau; and west by the province of the Rhine and the kingdom of Holland. Its area is 7,800 square miles. The capital is Münster. The province in the south and northeast is generally mountainous, being traversed by the Westerwald, Rothaar, Teutoburgerwald, and the Wesergeburge. The northwest spreads out into extensive and often marshy plains, and belongs to the basin of the Ems; the northeast and a small part of the east to the basin of the Weser; the remainder, constituting the far larger portion of the whole, belongs to the basin of the Rhine. The soil is in general far from fertile. Live-stock are numerous, particularly horned cattle, sheep, and swine; the hams made from the latter have long been famous. The staple manufacture is linen, but that of iron is also very extensive. Besides iron and coal in abundance the minerals include copper, lead, zinc, and salt. The province is divided into the three governments of Münster, Minden, and Arnberg.

Westphalia, Peace of, the treaty concluded in 1648 at Münster and Osnabrück, Westphalia (q.v.), which ended the Thirty Years' war, and established a new political system in Europe. After preliminaries had been settled at Hamburg toward the end of 1641 the actual negotiations were begun in 1644, at Osnabrück, between the empire, Sweden, and the Protestant states, at Münster between the empire, France, and other foreign powers. Two treaties were drawn up, one at Osnabrück, signed 6 Aug. 1648, and one at Münster, signed 24 Oct. 1648. Peace was restored with the signing of the latter. By this peace the religious and political state of Germany was settled. The sovereignty of the members of the empire was acknowledged. They received the right of concluding treaties among themselves and with foreign powers, only not against the emperor and empire. Their consent was made necessary to enable the emperor to put any of the members under the ban. The concessions that had been made to the Protestants since the religious peace in 1555 were confirmed. The form of public worship and the right to secularized ecclesiastical benefices were to return to what they were at the beginning of the so-called normal year 1624. The Calvinists (Reformierten) received equal rights with the adherents of the Augsburg Confession or the Lutherans. The elector-palatine had the palatinate of the Rhine and the electorate restored to him; Alsace was ceded to France; Sweden received Western Pomerania, Bremen, Verden, Wismar, and a sum equal to \$3,750,000; Brandenburg, Mecklenburg, Hanover, and Brunswick were compensated by the secularization of numerous ecclesiastical foundations. Germany lost altogether more than 40,000 square miles of territory, and about 4,500,000 inhabitants. The independence of the United Provinces was recognized by Spain, and that of Switzerland by the empire. The solemn protest of Pope Innocent X. against these terms, particularly in respect of the secularization of bishoprics and abbeys, etc., was not regarded; but the complete execution of the treaty was obstructed by many difficulties.

Westport, Conn., town in Fairfield County; on Long Island Sound at the mouth of the Saugatuck River, and on the New York, New

Haven & Hartford Railroad. It was established from portions of the towns of Weston, Fairfield, and Norwalk. Westport contains three villages. It is in an agricultural region, and has a number of industrial establishments, chief of which are cotton-twine and button factories, machine shops, and manufactories of satchels and morocco. It has a high school, elementary schools, and a public library. There are two banks. The national bank has a capital of \$100,000, and the combined deposits are (1903) \$268,000. Pop. (1890) 3,715; (1900) 4,017; (1910) 4,259.

Westwood, John Obadiab, English entomologist and archaeologist; b. Sheffield, England, 22 Dec. 1805; d. Oxford, England, 2 Jan. 1893. He devoted himself to sciences, making extensive researches in the fields of entomology and archaeology; was one of the founders of the Entomological Society of London in 1833, and from 1883 its honorary life president. From 1861 until his death he was professor of invertebrate zoology at Oxford. His works on both entomology and English archaeology are numerous and important. Among the former are: 'The Entomologists' Text-Book' (1838); 'Introduction to the Modern Classification of Insects' (1839-40); 'Arcana Entomologica' (1843); 'Butterflies of Great Britain' (1843); 'Orthoptera' (1843); 'Phasmid' (1843); 'Oxonien' (1843); 'milia' (1843); 'His archaeological works, which are enriched by his excellent reproductions of manuscripts and illuminations and also by his drawings of inscribed stones and old ivories, are well known. Among them are 'Palaeographia Sacra Pictoria' (1843-5); 'Wood Carvings' (1864); 'The Utrecht Psalter' (1874); 'The Early Inscribed and Sculptured Stones of Wales' (1876-9); 'The Book of Kells: a Lecture' (1887); etc.

Wet Bulb Thermometer. See **Thermometer**.

Wetherell, wēth'ēr-ēl. Elizabeth. See **WARNER, SUSAN**.

Wethersfield, wēth'ēr-z-fēld, Conn., town Hartford County; on the Connecticut River, and on the New York, New Haven & Hartford Railroad; three miles south of Hartford. In the summer it has regular steamer connections with New York and intermediate ports, and it is connected with Hartford and other near-by places by electric railways. It has manufactories of mattresses, copying presses, and agricultural implements. Important industries of the town are connected with the cultivation of seeds and the packing and shipping of the same. A historic building is the Webb house, where, in 1781, Washington and Rochambeau met. A State prison is located here. The educational institutions are a high school, public and private schools and a public library. Pop. (1890) 2,271; (1900) 2,637; (1910) 3,148.

Wetmore, Claude Hazeltine, American author; b. Cuyahoga Falls, Ohio, 1862. He was educated at Western Reserve University, Cleveland, Ohio, and the Ecole Polytechnique, Lausanne, Switzerland, and subsequently spent ten years in South American travel. He has published 'Sweepers of the Sea' (1900); 'Fighting under the Southern Cross' (1901); 'In Inca-land' (1902); 'In a Brazilian Jungle' (1903).

Wetter, vē't'ēr, Sweden, a lake about 24 miles southeast of Lake Wener, extending between the läns of Mariestad, Örebro, Länköping, and Jönköping; greatest length, 80 miles; medium breadth, about 15 miles; area, 715 square miles. Its height above the level of the Baltic is nearly 300 feet, but its depth is in some parts above 400 feet, or 120 feet below the Baltic level. Its water is very clear. It has periodic rises and falls independent of the wetness or dryness of the season, and is subject, even in the calmest weather, to violent underground swells. When these take place in winter the sounds emitted by the ice in cracking and breaking up are often tremendous. An underground ridge is traceable throughout the whole length of the lake from north to south, and its culminating points form the few islands which appear above its surface. The largest of these is the Visingsö, in the south. The Wetter forms part of a general line of navigation, which extends across the kingdom from east to west, and far into the interior. By the Gotha Canal it communicates with Lake Wener, and by the Motala Canal with the Baltic. The scenery of the lake is in many places magnificent; the chief town on its shore is Jönköping.

Wetterhorn, vē't'ēr-hörn ("peak of tempests"), Switzerland, one of the most striking peaks of the Bernese Oberland; has three summits—the west, called by the natives Haali-Jungfrau, 12,147 feet high; the middle, known as the Mittelhorn, 12,165 feet; and the east, the Rosenhorn, 12,110 feet. These were ascended first in 1844 and frequently since, the ascent being made from Grindelwald. The contrast between the bright fresh pastures and the black precipices and dazzling snow ridges of the Wetterhorn is particularly striking, making the valley of the Reichenbach a favorite resort of artists.

Wexford, wēks'fōrd, Ireland, a seaport town, capital of the county of the same name, at the mouth of the river Slaney. The town is irregularly built, and the streets narrow, but it contains some handsome buildings. It has a county court-house, town-hall, prison, theatre, barracks, etc.; three Roman Catholic churches, besides several Protestant places of worship, nunneries, a Roman Catholic college, and various schools. Above the town there is a bridge across the river 1,500 feet in length. Wexford was a Danish settlement of great strength; it was captured by Cromwell in 1649; remains of its ancient walls exist. The harbor is spacious, but has a bar across the mouth. There is a dockyard and patent slip. The herring and salmon fisheries employ many persons; malt, agricultural implements and machinery are manufactured, and distilling and brewing are carried on. The chief trade consists in the exportation of grain, cattle, poultry, butter, etc. In 1885 Wexford ceased to be a parliamentary borough.

Weyden, vī'dēn, Rogier van der, Flemish painter; b. Tournay about 1400; d. Brussels 16 June 1464. In 1426 he was apprenticed to learn painting, in 1432 became master in the painters' guild of Tournay, and in 1436 was chosen town artist of Brussels. His four works illustrating justice, executed for the "golden chamber" of the Hôtel de Ville, were destroyed by fire in 1603. In 1449 he journeyed to Italy, where he worked at Ferrara for Leonello d'Este, and painted also

WEYER'S CAVE—WHALE

for the Medici and the Storms. He was the founder of the Brabant school. Among his principal extant works are: A triptych in the Belvedere of Vienna; a triptych, 'The Last Judgment,' in the Beune Hospital; and 'The Descent from the Cross' (Madrid gallery). Consult the study by Wauters (1856); and Crowe and Cavalcaselle, 'Early Flemish Painters' (3d ed., 1879).

Weyer's (wē'ez) Cave, in Augusta County, Va., 11 miles northeast of Staunton. It is a large stalactitic cavern, in a spur of the Blue Ridge; and it contains a number of chambers, the largest of which is called Washington's Hall. This chamber is 250 feet long and nearly 100 feet high. This cave ranks next in importance to Mammoth and Wyandotte caves.

Weyler y Nicolau, wā'ler ē nē'kō-low, Valeriano, MARQUIS OF TENERIFFE, Spanish general: b. Palma, island of Majorca, 17 Dec. 1838. He was educated in Granada, entered the infantry school in 1853, and became under-lieutenant in the staff school in 1857. He was appointed lieutenant of the staff in 1860, and rose through higher ranks until in 1878 he became lieutenant-general. He was military attaché of the Spanish legation at Washington during the American Civil War, and in 1868 was ordered to Cuba, where he served under Balmaceda through the ten years' war. He was appointed governor-general of the Canaries in 1879, captain-general of the Philippines in 1889, and was afterward provincial governor of Catalonia. He succeeded Martínez Campos as captain-general of Cuba in 1896, and by the perpetration of many barbarities added to an already infamous record for cruelty in the conduct of the war then being waged on the island. His inhuman methods aroused the indignation of the people of the United States, where he became known as 'Butcher Weyler,' and in 1897, upon the change of cabinets in Spain, he was recalled. In 1901-2 he was minister of war in Sagasta's cabinet.

Weyman, wē'man, Stanley John, English novelist: b. Ludlow, Shropshire, 7 Aug. 1855. He was educated at Shrewsbury School and Christ Church, Oxford, studied law, and was called to the bar in 1881. For nine years he practiced on the Oxford circuit, and then began a literary career in 1890 by publishing a romance entitled 'The House of the Wolf.' It was succeeded by 'The New Rector' (1891) and 'The Story of Francis Cludde' (1891), but it was his brilliant story, 'A Gentleman of France' (1893), that first brought him into prominence, and on his historical novels his reputation rests. His later works include 'Under the Red Robe' (1894); 'My Lady Roths' (1894); 'The Red Cockade' (1895); 'The Man in Black' (1896); 'Shrewsbury' (1897); 'The Castle Inn' (1899); 'Sophia' (1900); and 'Count Hannibal' (1901). His tales are well constructed and written in a workmanlike manner, with plenty of incident and adventure, and the interest is well sustained.

Weymouth, wā'mūth, England, seaport in Dorsetshire, on a beautiful semicircular bay, seven miles south-southwest of Dorchester. The borough comprises Melcombe-Regis, from which it is separated by the small river Wey. It is well built; has two parish churches, one of them in Melcombe-Regis; several other places of worship, a general and an eye infirmary, town-hall,

reading-room, Victoria Jubilee hall, libraries, etc. There is a considerable coasting trade, and an active traffic, passenger and other, with the Channel Islands and France. There are ship-building, sail-making, and rope-making establishments. Portland stone is exported from the neighboring isle of Portland (q.v.). Both Weymouth and Melcombe-Regis, particularly the latter, from the beauty of the bay and its smooth, firm sands, attract numerous visitors. There is a fine esplanade about one mile in length. Pop. about 22,000.

Weymouth, Mass., town in Norfolk County; on Boston Harbor, and on the New York, New Haven & Hartford Railroad; 12 miles southeast of Boston. Electric lines connect the town with Boston and the near-by towns. Weymouth contains seven villages, each one having a post-office. It has manufactories for boots and shoes, hammocks, fireworks, and machinery. It has car-repair shops and extensive wool-scouring yards. The educational institutions are grammar and primary schools, private schools, Tufts Library, which contains about 20,000 volumes, the Fogg Library, and a high school at Weymouth Centre. The town owns and operates the water-works.

The first permanent settlement was made in 1623 by Capt. Robert George, but the place had been visited often before this time, notably in 1622 by Thomas Weston. The place was first called by the Indian name *Wemagusset*, until it was incorporated 2 Sept. 1635, when the present name was adopted. Pop. (1900) 11,324; (1910) 12,895. Consult Adams, 'Proceedings on the 250th Anniversary of the Permanent Settlement of Weymouth.'

Weyr, vir, Rudolf, Austrian sculptor: b. Vienna 22 March 1847. A pupil of Bauer and Cesar at the Vienna Academy, he won the Reichel prize with his 'Samson and Delilah' (1870), and in 1878 was commissioned to execute the decorations of the Grillparzer monument. His reliefs and experiments in polychrome sculpture won for him a considerable reputation. Besides numerous decorations for the university and museum buildings at Vienna, his works include the 'Triumphal Procession of Bacchus and Ariadne' for the pediment of the Burgtheater, and the great fountain before the Imperial palace.

Whale. Any large cetacean is called a whale, while any small representative of the order is usually called a porpoise or dolphin. This division of the group is unscientific, however, and breaks down when the moderate-sized forms are in question, the layman being always in doubt whether these are to be classified as whales or as porpoises.

It happens that all cetaceans having whalebone, instead of teeth, or those constituting the suborder *Mystacoceti*, are of large or huge size. These may be all quite properly called whales, but it will be necessary for the present purpose to add to this natural group the sperm whale, a representative of the toothed whales, or suborder *Odontoceti* and the bottlenosed, or ziphioid, whales, which constitute the family *Ziphiidae*, and also belong among the toothed whales. The order then stands as follows:

Order *Cetacea*. *Cetaceans*.

Suborder *Mystacoceti*. All cetaceans with whalebone.
Family *Botaniidae*. (Co-extensive with the suborder.)
Suborder *Odontoceti*. All cetaceans with teeth.

WHALE

Family *Physeteridae*. Sperm whales.
Family *Ziphiidae*. Bottlenosed whales.
Family *Delphinidae*. Porpoises or dolphins.
Family *Platanistidae*. River dolphins.

Whalebone Whales.—Whalers recognize several species or groups of whales with whalebone, to which they give the names of right whales, humpbacks, finbacks and sulphurbottoms. These correspond to natural groups or genera, except that the sulphurbottom is really a kind of finback. To these are to be added the California gray whale, or grayback, a very distinct genus, combining characters of right whales and finbacks, and the pygmy right whale of New Zealand. These various genera may be distinguished by the following external characters:

Humpbacks (genus *Megaptera*).—Form bulky and uncouth. Head broad and rounded in front, and flat on top, with rows of hemispherical tubercles. Belly with many broad longitudinal ridges and furrows. Pectoral fins very long (about one third the length of the body), with serrations corresponding to the joints of the index finger. A low, thick dorsal fin. Flukes with a serrated margin. Color black and white. Whalebone short, dull blackish.

Finbacks (genus *Balaenoptera*).—Form slender and graceful. Head broad and flattish, more or less pointed in front. Belly with very numerous narrow ridges and furrows. Pectoral fins short, with plain margins. A falcate dorsal fin. Color gray and white. Whalebone short, striped gray and white, or entirely black, or black with white bristles, or entirely white.

California Gray Whale (genus *Rhacianectes*).—Form rather slender. Head comparatively narrow, moderately arched and pointed. No abdominal ridges or furrows, but two short furrows on the throat. No dorsal fin. Pectorals short. Color mottled gray. Whalebone short, white.

Right Whales (genus *Balana*).—Form heavy and compact. Snout very narrow, and strongly arched. No ridges or furrows. No dorsal fin. Pectorals short and very broad. Color entirely black, or with a little white below. Whalebone very long, narrow, black.

Pygmy Right Whale of New Zealand (genus *Neobalana*).—Similar to *Balana*, but size small. A dorsal fin present. Whalebone white.

Humpbacks.—The humpback is in many respects the most remarkable of all whales. It reaches a length of about 50 feet. The anterior part of the body is very massive, but the posterior quite slender and at the same time so irregularly shaped and so awkwardly joined to the thorax that the animal appears misshapen. This effect is heightened by the dorsal fin, which is low and thick, with a concave anterior margin, and rounded tip. Not less striking are the immense crenate-margined pectoral fins, like the wings of a bird, and about one third as long as the body. The broad abdominal ridges nearest the median line join below on the throat, forming a chin-like protuberance. Humpbacks are infested by large barnacles of the genus *Coronula*, which fasten on the head, fins, flukes and abdominal ridges. Where they settle on the black skin but are afterward rubbed off, or otherwise got rid of, they leave behind distinct white marks, in the form of disks, circles, crescents, etc., which add to the singular appearance of these whales. Fastened to the large barnacles, are often bunches of

stalked barnacles, genus *Onion*, which hang down like fringes on the fins. Some nine or ten species of humpbacks have been described, but wherever observed they present characters so nearly alike that it is extremely probable that all belong to one widely-diffused species. The species of the Atlantic coast of North America and Europe is *Megaptera nodosa*. Humpbacks occur in all seas, from the Arctic to the Antarctic. They congregate in bands, or schools, which sometimes number hundreds or even thousands of individuals. They are very irregular in their movements and indulge in all manner of uncouth actions. When they dive or sound they throw the flukes out of the water. Like other cetaceans they engage in seasonal migrations northward and southward. In the North Atlantic they withdraw from the waters of Greenland, Newfoundland, Iceland, and Norway in fall and return in spring. They feed chiefly on fish.

Sulphurbottom, or Blue Whale (*Balaenoptera musculus*).—The sulphurbottom, as already stated, is a species of finback. Wherever finbacks are observed there are found to be four distinct forms. Each of these has been described from different localities under different names, but the variations are slight in each case, and have never been fully established, so that there is a strong probability that there are but four cosmopolitan species. These are the sulphurbottom, the common finback, the pollack whale, and the little piked whale. Each form will now be considered separately, beginning with the sulphurbottom. The sulphurbottom is the largest of whales and the largest of all animals now existing, and was probably not surpassed in size by any animal living in earlier geological times. The largest individual of which there are authentic measurements was 88½ feet long. The average length for adults is about 76 feet. The sulphurbottom has a massive head and broad snout, and the body tapers gradually to the flukes. The dorsal fin is falcate and less than a foot high, and is situated at a point a little more than three fourths the distance from the tip of the snout to the notch of the flukes. The pectoral fins are falcate and about 7½ feet long, from the axilla. In color the sulphurbottom is gray, nearly uniform on the head, but mottled on the back and sides. On the belly are numerous white spots. The pectoral fins are gray above and white below, the flukes gray on both sides, and the dorsal fin also gray, sometimes with a whitish centre. The abdominal ridges number 62 to 88. The whalebone is about three feet long, broad at the base, and black in color, both plates and bristles. These huge whales feed exclusively on small crustaceans, the species in the North Atlantic being the thysanopod *Euphausia inermis*. The sulphurbottoms congregate in the bays of southern Newfoundland, Iceland, and northern Norway in early spring and remain until about July. Some individuals, however, appear to remain throughout the year, and their migrations are irregular and not well understood. They rarely strand on the east coast of the United States, nearly all the individuals reported as such belonging to the next species, the common finback.

Common Finback (*Balaenoptera physalus*).—This is the most commonly observed and best known of the finbacks. In size it ranks next to

WHALE

the sulphurbottom. The form is exceedingly attenuated. Adult individuals reach an average length of 65 feet. The head is narrow anteriorly. The dorsal fin exceeds a foot in height and is situated as in the sulphurbottom. The pectoral fins are small, somewhat triangular, and about 5 feet long, from the axilla. This whale is gray on the back and upper surfaces of the pectoral fins and flukes, and white on the belly and the under surfaces of the pectoral fins and flukes. The whalebone as a whole is gray, striped longitudinally with white, but at the anterior end of the jaw on the right side the whalebone is all white. The outside of the right lower jaw is also white. These parts are dark on the left side. This singular asymmetry of coloration is peculiar to, and characteristic of, the species. The common finback feeds on various kinds of small fish, especially the capelin, herring, young cod, etc.

In the North Atlantic it appears in spring in Massachusetts Bay, the Gulf of Maine, about Newfoundland, and in Greenland waters, as well as on the coasts of northern Europe. In the fall it withdraws from these waters and is supposed to migrate southward. The large whales which strand on the east coast of the United States are almost invariably of this species. When swimming or rising to spout, this whale, like the sulphurbottom, shows the top of the head and back and the dorsal fin, but nothing beyond. The flukes are not thrown out of the water when it dives or sounds.

Pollack Whale, or Rudolph's Rorqual (Balænoptera borealis).—This is a smaller whale than either of the preceding, adults reaching a length of about 45 feet. The form is more compact, the dorsal fin larger and more anteriorly placed. It is black on the back and sides, with a restricted gray or whitish area on the belly. The pectoral fins and flukes are dark gray, both above and below. The whalebone plates are black, but the bristles white. This whale, like the sulphurbottom, feeds on small crustaceans. Although large numbers of individuals were taken on the northern coast of Norway in some years when the fishery was at its height, it appears to be less abundant than the larger species. It was not positively known to occur on the east coast of North America until 1903, when four specimens were taken at the Newfoundland whaling stations. It cannot yet be considered more than a straggler in American waters. A similar, or identical, species has been observed in the Pacific Ocean, but little is known regarding it.

Little Piked Whale, or Lesser Finner (Balænoptera acuto-rostrata).—This is the smallest of the finbacks, and is not sought for by whalers. The form is thickset like that of a porpoise, and the head pointed. When adult, it is about 25 feet long, and the maximum length is about 28 feet. The dorsal fin is larger than in any of the other finbacks, and is situated farther forward, or at a point only about two thirds the distance from the tip of the snout to the notch of the flukes. It is very dark gray or blackish on the back and sides, and white on the belly, a little clouded with gray. The pectoral fins are blackish above, with a broad cross-band of white near the middle; below they are white. The flukes are blackish above and whitish below. In this species the abdominal ridges are very numerous and narrow. The whalebone

is very short and entirely white. The little piked whale feeds upon fish. It is found with the other species of finbacks in the North Atlantic, migrating northward and southward in the same manner, according to the season. A few specimens have been observed on the coast of New England, New York, and New Jersey, either stranded, or entangled in the nets of the fishermen. Whales of the same size and form, and with the same peculiar markings, have been observed on the coast of New Zealand, Argentina, Washington, Alaska, and in other widely separated localities.

California Gray Whale, Grayback or Devil-fish (Rhachianectes glaucus).—This remarkable whale is found only in the North Pacific. Its characters have been already enumerated above. When full-grown it has a length of about 40 feet. It is a restless and sagacious animal, and when wounded frequently attacks the boats sent out for its capture. In earlier days it was found abundantly in the winter months in the lagoons and bays of Lower California whither it repaired to breed. It is fond of playing in the surf and approaches close inshore to indulge in this recreation without fear of stranding. The gray whale is found as far northward as Bering Sea, and occurs also on the coast of Japan, but has no counterpart in other seas.

Greenland Right Whale, Arctic Right Whale, or Bowhead (Balæna mysticetus).—In reviewing the observations of earlier zoologists, Cuvier came to the conclusion that but one species of right whale existed in the North Atlantic and Arctic oceans, an erroneous opinion, which nevertheless was accepted until the Danish cetologist Eschricht proved that the right whale of the Arctic was quite distinct from the species occurring farther south. This Arctic right whale, or bowhead, as it is called by American whalers, is most remarkable in appearance. The snout is narrow and arched like a bow. From the roof of the mouth depends the extraordinary, narrow black whalebone, which may be 12 feet long or even longer. This whalebone is enclosed and protected by the immense oblong lower lip, the curved upper edge of which fits against the side of the upper jaw when the mouth is shut. The back is without a fin, while the pectorals are short and broad. There are no ridges or furrows on the belly. Adults reach a length of about 60 feet. The bowhead rarely or never leaves the Arctic ice, but like other whales it migrates northward and southward with the changes of the seasons. On the east coast of America it is never seen as far south as the southern extremity of Greenland, though there is a tradition that at the time of the discovery of the country it ranged as far south as the Strait of Belle Isle in winter. It occurs in the Arctic Ocean north of Alaska and ranges southward into Bering Sea. Individuals are believed to pass back and forth through the channels between the islands north of the continent from the eastern to the western side. The bowhead feeds chiefly on small pteropod mollusks and crustaceans which occur in vast multitudes in the Arctic Ocean. It is the most valuable of whales from a commercial point of view, on account of the thickness of the blubber and the length and fine quality of the whalebone, which at present commands exceedingly high prices. Its constant pursuit for three cen-

WHALE

turies has now very greatly diminished its abundance.

Atlantic Right Whale, or Black Whale (Balena glacialis).—This whale resembles the bowhead in general appearance, but the head is smaller and less arched, and the whalebone shorter, or only about seven feet long. Near the end of the snout is a low rounded protuberance, called the "bonnet" by whalers. This bonnet is covered with barnacles, which are not found adhering to the bowhead. The black whale, as its name implies, is usually entirely black, but some individuals have been reported as whitish or grayish on the throat and breast. When full-grown it reaches a length of about 50 feet. Like the bowhead it feeds upon crustaceans and pteropod mollusks. The species has been nearly exterminated, but in former days it appeared regularly in the bay of Biscay in winter and migrated northward to Iceland and northern Norway in spring. On the North American coast it ranges, or did range, as far south as Georgia in winter and toward the close of that season, or in early spring, appeared in Delaware Bay and off the coast of Long Island and Massachusetts, and later in the Gulf of Saint Lawrence. A few individuals still appear quite regularly off Long Island.

There is every reason to believe that this whale was the object of pursuit of the earliest whale fishers among the Basques in the Bay of Biscay in the Middle Ages. It was the species on which the American Colonial shore whale-fishery was based. So persistently was it pursued, however, that for many years it was supposed to be extinct and no remains which could be identified with it were to be found in any museum. Within the last 25 years, a few individuals have appeared every spring off the east coast of the United States, and a few have been captured, or have stranded, on the coasts of southern Europe and Iceland. As the right whale does not occur within the tropics, it has been questioned whether the large species observed about New Zealand, in the North Pacific and in other waters is the same as that of the North Atlantic. Opinion is at present divided on the subject, but it is generally conceded that the real differences between the right whales of the northern and southern temperate seas, if any, have yet to be pointed out. The Atlantic right whale, like the bowhead, feeds upon pteropod mollusks and crustaceans.

Pygmy Right Whale of New Zealand (Neobalena marginata).—This is a remarkable little whale, resembling the large right whales, but reaching a length of only about 20 feet. It has a small dorsal fin, but no abdominal ridges or furrows. The whalebone is long and white. In color the whale is black, with a line of white along the belly. It has many osteological peculiarities, among which one of the most striking is the flatness and breadth of the ribs, of which there are 17 pairs. The lumbar vertebrae are only two in number. Little is known of the habits of this whale.

Sperm Whale (Physeter macrocephalus).—This whale, as already stated, belongs to the *Odontoceti*, or toothed whales, one of the two main divisions of the order Cetacea, which includes also the porpoises, river-dolphins, and bottlenosed or beaked whales. But one species of sperm whale is known. When full-grown the male reaches a length of 60 or 65 feet, but the

female is much smaller. The head is of immense size, and is shaped like an elongated wedge with the base uppermost, and the edges and free end rounded. The blowhole is single and situated at the end of the snout on the left side. The lower jaw is very narrow and much shorter than the upper, and the two sides are joined together anteriorly for about one half the length. In it are implanted about 44 large conical teeth which fit into pits in the upper jaw when the mouth is closed. There are no teeth in the upper jaw. The back is without a fin, but is raised into a number of low irregular humps posteriorly. The pectoral fins are broad and about six feet long. In color the sperm whale is blackish above and somewhat mottled with gray below. It occurs in all seas except the Arctic and Antarctic, but is essentially an animal of the tropics. The herds or schools are diversified in character, some comprising only young bulls, other females and young led by an old bull, etc. At times old bulls are encountered wandering singly or in small groups. These old males are ill-tempered and pugnacious, and do not hesitate to attack the boats of the whalers. The sperm whale feeds upon large cuttlefish, which its great strength and powerful under-teeth are supposed to enable it to dislodge from their rocky retreats at the bottom of the sea.

Bottlenosed Whales, or Beaked Whales (family Ziphiidae).—This family comprises four or five genera of small whales, none of them exceeding about 30 feet in length. Several species of each genus have been described, but many of them appear to be without a certain foundation. Like the sperm whale, they belong to the sub-order *Odontoceti*, or the toothed whales. They never have, however, more than four teeth regularly implanted in the jaws, but some species have numerous minute rudimentary teeth imbedded in the lips. The head of all the forms, at least in the young, is pointed, the dorsal fin low and placed far back toward the flukes, the pectoral fins narrow, and of moderate length. In the bottlenosed whale of the North Atlantic (*Hyperoodon rostratum*) the forehead gradually increases in size with age, until it is sharply marked off from the narrow beak, like the shoulder of a bottle. This species congregates in large herds and is eagerly sought by whalers for its oil. The beaked whales of the remaining genera, *Mesoplodon*, *Berardius*, and *Ziphius*, are far less abundant. They travel in pairs. *Hyperoodon* is peculiar to the North Atlantic, *Berardius* occurs only in Bering Sea and about New Zealand, while *Mesoplodon* and *Ziphius* appear to be cosmopolitan genera. The beaked whales subsist upon cuttlefish.

Spermaceti.—Spermaceti is the solid constituent of the crude oil of the sperm whale and some other cetaceans. The head of the sperm whale, between the skull and the integuments, is a kind of large reservoir of a semi-solid "head-matter" rich in spermaceti, but the substance is also contained in the oil of other parts of the body and especially the dorsal hump. To extract the spermaceti, the oil is boiled, chilled and afterward submitted to a heavy pressure. The crude brown spermaceti is refined by heating and bleaching with alkali. Spermaceti is a whitish, translucent substance, a little lighter than water, and soluble in chloroform, ether and carbon bisulphid. It melts at

WHALE-BIRD — WHALING

about 125° F. Though an excellent substance for candles, it has been very largely supplanted for that purpose by paraffin and other low-priced materials. The production in the United States in 1901 amounted to 400,000 pounds, valued at \$100,000.

Whalebone.—Whalebone is the outgrowth of horny substance from the epidermis of the upper jaw in whales of the family *Balaenidae*. It takes the form of triangular plates, which differ greatly in size, proportions and color in different species. Plates to the number of 200 or 300 are attached by their bases transversely to the roof of the mouth on each side. They are longest in the middle of the series and at the ends become mere bundles of fibres. The plates are smooth and straight on the outer edge, but the inner edge is fringed with coarse bristles. The bristles of adjoining plates become matted together, forming a strainer by which the whale is enabled to retain in its mouth the fish or small crustaceans, etc., on which it feeds, while the water is squeezed out through the plates by the action of the tongue. In the right whales, the humpback and the sulphurbottom, the whalebone is black or blackish; in the common finback striped gray and white; in the pollack whale, black with white bristles; and in the little piked whale, the California gray whale and the pygmy right whale of New Zealand, yellowish-white. The most valuable whalebone commercially is that of the right whales, and especially that of the bowhead, which may have a length of from 10 to 12 or even 15 feet, and is very flexible. A single bowhead yields 2,000 pounds of whalebone, valued at from \$5 to \$7 a pound.

Whalebone from the humpback, sulphurbottom and finback is short, coarse and brittle, but also enters into commerce. Whalebone is used in the manufacture of corsets, in stiffening and adding gloss to certain kinds of cloth, for surgical instruments, whips, etc.

F. W. TRUE,

United States National Museum.

Whale-bird. See FULMAR.

Whale-head, a stork. See BALENICEPS.

Whale-louse, any of various small crustaceans parasitic on whales. (See FISH-LICE.) These crustaceans have a rudimentary abdomen, and have the limbs of the first joint of the thorax or chest inserted beneath the throat. The body is flattened and of oval shape, and the legs are all prehensile. They burrow deeply into the skin of their hosts.

Whale Oil. The use of whale oil appears to be of ancient origin. It was doubtless first obtained from whales accidentally stranded on the shores, a more frequent occurrence during the early abundance of the cetaceans than at present, when their numbers have been so greatly reduced by excessive fisheries. As the demand for the oil increased beyond the supply available from stranded whales, individuals sighted from the shore were attacked and beached. Owing to the frailty of the boats and equipment, this was a more daring attempt than might be supposed. Just prior to the Revolutionary War there were 183 American vessels in the right-whale fishery of the North Atlantic waters, and 125 were engaged in cruising for sperm whales from Newfoundland to the coast of Brazil. The Revolutionary War and the War of 1812 interfered with the fisheries;

but during the period of peace following 1815 they increased greatly in extent until 1846, when the fleet numbered 678 ships and barks, 35 brigs, and 22 schooners, a total of 735 vessels, with an aggregate tonnage of 233,189 tons, and a value of \$21,075,000, exclusive of outfits and supplies. The entire capital invested in the fishery and its associated industries at that time approximated \$40,000,000, and 40,000 persons derived from it their chief support. During the same year the whaling fleet of all Europe numbered but 230 vessels. The crude value of the American catch from 1840 to 1860 averaged about \$8,000,000 annually. The greatest value was in 1854, when 2,315,924 gallons of sperm oil worth \$1.48½ per gallon, 10,074,866 gallons of whale oil worth 59½ cents per gallon, and 3,445,200 pounds of whalebone worth 39 1-5 cents per pound were secured, the total value being \$10,802,594. In the preceding year, 1853, the total product was 3,246,925 gallons of sperm oil 8,193,591 gallons of whale oil, and 5,652,300 pounds of whalebone, the whole valued at \$10,766,521. Sperm oil and whale oil then served nearly all the diversified uses for which oil was required, the chief exception being leather-dressing, for which neatfoot and cod oils were largely employed. The principal uses were as illuminant, lubricator, in cordage manufacture, screw-cutting, and steel-tempering. The streets of the principal cities were lighted with the oil, and theatres and public buildings were lighted with gas made from the foets.

In 1902 the whaling fleet of the United States consisted of 8 steamers, 18 barks and brigs, and 12 schooners, aggregating 8,366 tons. Of these, 11 barks and 10 schooners were sperm-whale fishing in the Atlantic Ocean, 8 steamers in the Arctic, 6 barks in Okhotsk Sea and off the coast of Japan, 2 schooners in Hudson Bay, and 1 brig at Desolation Island. The total whale-oil product of the world at present approximates 3,000,000 gallons yearly, of which 750,000 gallons are produced by the United States fisheries, 900,000 by those of Norway, and the remainder by Scotland, Russia, Japan, Newfoundland, etc.

The following tabulated statement of the yield of oil from the several species of cetaceans has been prepared after consultation with the most experienced whalers of various ports:

	Yield of oil in barrels of 31½ gallons	
	Variations	Average
Right whale, Pacific.....	25 to 250	90
Right whale, Atlantic....	25 150	75
Bowhead	30 250	100
Sperm whale	5 145	45
Humpback, Pacific.....	10 110	48
Humpback, Atlantic ..	10 100	40
Finback, Pacific.....	10 70	35
Finback, Atlantic.....	20 60	38
California gray whale....	15 60	30
Bottle-nose whale	4 25	12
Orca or killer whale....	1 6	2½
Beluga or white whale...	¾ 3	1½
Black-fish	¼ 4	1½

Whaleback Steamship. See STEAM VESSELS.

Whalebone. See WHALING.

Whaling, or the pursuit of whales as an industry, originated in Europe at a remote period. There are obscure references to it

WHALLEY

among the Norwegians and English as early as the beginning of the 10th century. As early as the 11th century the Basques pursued the North Atlantic right whale, or black whale, (*Balaena glacialis*), with harpoons, in open boats. It is even asserted that they crossed the Atlantic in pursuit of their quarry before the time of Columbus, but this has not been substantiated. Certain it is, however, that they visited Newfoundland immediately after the discovery of America and captured the same species of right whale in those waters. They are supposed also to have first seen the Arctic right whale, or bowhead (*Balaena mysticetus*), in the Strait of Belle Isle. In 1607 Henry Hudson encountered the bowhead in the vicinity of Spitzbergen. The Spitzbergen fishery developed rapidly on account of the large amount of oil yielded by this species, and was extensively engaged in by various European nations, especially the Dutch who in 1680 employed 260 vessels and about 14,000 men in the industry. During the decade beginning 1679, the Dutch took an average of about 1,000 whales annually. As the bowheads decreased about Spitzbergen, they were sought for to the westward, and in 1719 a Dutch vessel first entered Davis Strait. This fishery was developed chiefly by the British, Danes, and Americans. In 1789 there were 255 British vessels engaged in it. The first American vessel visited Davis Strait in 1732. The number increased rapidly and at the height of the fishery, just before the Revolutionary War, Massachusetts alone sent 183 vessels to the strait.

About 1670, the American colonists succeeded in establishing a boat shore-fishery for the Atlantic right whale, which in those days was abundant on the coast, especially off Long Island and in Delaware Bay, and was well known from a much earlier date through stranded individuals. Later the colonists pursued it in sailing vessels farther from shore and in the Gulf of Saint Lawrence, but finally turned their attention to the Arctic right whale, or bowhead, in Davis Strait, as already mentioned.

About 1712 the first sperm whale was captured at sea by a Nantucket whaler. This fishery rapidly rose in importance and was pursued in all quarters of the globe, especially by the Americans. The British did not apply themselves to it until 1775, but in 1790 a British whaling vessel rounded Cape Horn and opened up the Pacific fishery, which immediately grew to enormous proportions, and was at its height in 1837. The American whaling fleet in 1839 comprised 555 vessels, of which the majority were engaged in the Pacific sperm-whale fishery. In 1847 the number rose to 594, while the foreign whaling fleet numbered 230 vessels. The size of the American fleet reached its maximum in 1846, when 729 vessels were employed.

While a large part of the American fleet was engaged in the pursuit of the sperm whale, the remaining vessels were chiefly employed in hunting right whales, especially in the North Pacific. As the sperm-whale fishery declined, this branch increased in importance. In 1835 the famous Kadiak ground was discovered. A new epoch opened in 1843 when bowhead whales were first taken off the Kamchatka coast. In 1848 the first vessel passed through Bering Strait to pursue these large whales in the Arctic Ocean. The fishery in the North Pacific and adjoining Arctic was at its height in 1852, when 278 vessels were

employed. In 1866 the first American steam whaling-vessel was brought into use, and in 1880 two steamers were added to the Pacific-Arctic fleet.

The introduction of mineral oils for illuminating and other purposes, and the decrease in the abundance of whales, gradually broke down the fishery for right and sperm whales and at the present time the number of vessels engaged in the industry is but a handful compared with the fleets of former days. A few sailing vessels still pursue the sperm whale, but in 1902 only five British vessels (steamers from Dundee, Scotland), entered Davis Strait in pursuit of the bowhead. The American whaling fleet in 1902 comprised 38 vessels, including eight steamers engaged in the Pacific-Arctic bowhead fishery. Of the remaining 30 sailing vessels, 21 engaged in sperm whaling in the Atlantic; six visited Okhotsk Sea and the coast of Japan, two entered Hudson Bay, and one remained about Desolation Island. Whale-oil has greatly declined in value, but the whalebone of the bowhead, which in earlier days was worth only a few shillings a pound, now brings from five to seven dollars a pound. As a single bowhead yields 2,000 pounds or more, the profit from even a single whale is large.

The humpback whale was always pursued to some extent by right-whale whalers, but the finbacks and sulphurbottoms, besides furnishing a relatively small amount of oil, were too swift to be attacked successfully with hand-harpoons. About 1865, however, Svend Foyn, a Norwegian fisherman, invented a method of shooting them with a combined harpoon and bomb fired from a swivel gun mounted at the bow of a small steamer, and for 30 years large numbers of sulphurbottoms, finbacks, and humpbacks were killed annually at stations established on the coast of Finnmark. Later the same method was employed at Iceland, The Farøe and Shetland Islands, and also about Japan. In 1898 this mode of whaling was introduced into Newfoundland, where several hundred sulphurbottoms, common finbacks and humpbacks are now killed annually.

A considerable number of common finbacks and humpbacks have been killed in Massachusetts Bay and the Gulf of Maine during the last 25 years by means of explosive bombs attached to a special form of hand-harpoon, called a "darting gun." A boat-fishery of limited extent has been in existence for many years on the coast of California. It has for its object the capture of the California gray whale, and the humpback, which are killed by harpoons fired from a swivel gun mounted at the bow of a whale boat. Similar boat-fisheries exist on the coast of New Zealand, in the West Indies, and in other parts of the world.

F. W. TRUX,

United States National Museum

Whalley, hwô'l, Edward, English regicide: b. England about 1620, d. Hadley, Mass., about 1675. He was in trade, probably that of woolen-draper, at the outbreak of the Civil War, when he enlisted for Parliament. In 1643 he became major in Cromwell's regiment of horse, and in 1644 after having fought at Gainsborough and Marston Moor, appears as a lieutenant-colonel. He was made colonel of one of the two parts into which Cromwell's regiment was di-

WHARTON—WHARVES AND WHARF CONSTRUCTION

vided, and with this force took Banbury and Worcester. Later, he was superseded. After Charles I. was seized, Whalley was ordered to take charge of the king, and in that post displayed much tact. He sat for Nottinghamshire in the two parliaments assembled by Cromwell, and in 1657 was made a member of the new House of Lords. He went to Scotland as agent of the army to mediate with General Monk, but had no success. On the Restoration he did not obey the summons of surrender of the king's judges, and was therefore excluded from the indemnity. He sailed with William Goffe (q.v.) for New England, arrived at Boston 27 July 1660, resided for a time in Cambridge, but when the act of indemnity reached Boston in November and the town council met (February 1661) to consult regarding the refugees, went with Goffe to New Haven, where they arrived 7 March. He was associated with Goffe in the subsequent wanderings and concealments which have lent such interest to their history. Consult. Stiles, 'History of Three of the Judges of Charles I.' (1704); Noble, 'Lives of the Regicides' (1798); Hutchinson, 'History of Massachusetts' (3d ed. 1795); and the 'Collections' of the Massachusetts Historical Society, 3d ser. I. 60, 4th ser. VIII. 122. Mrs. H. M. Lothrop's romance 'The Judges' Cave' (1901) is founded on incidents in the New England career of Goffe and Whalley.

Wharton, hwar'ton, Anne Hollingsworth, American author: b. Southampton Furnace, Pa., 15 Dec. 1845. She has written mainly though not entirely upon colonial themes and among her books are: 'The Wharton Family' (1880); 'Through Colonial Doorways' (1893); 'Colonial Days and Dames' (1894); 'A Last Century Maid' (1895); 'Martha Washington: A Biography' (1897); 'Heirlooms in Miniature' (1897); 'Salons Colonial and Republican' (1900); and 'Social Life in the Early Republic' (1902).

Wharton, Edith Jones, American novelist: b. New York 1862. She was privately educated and was married to Edward Wharton in 1885. She has since resided much abroad, and has published 'The Greater Inclination' (1899); 'The Touchstone' (1900); 'Crucial Instances' (1901); 'The Valley of Decision' (1902); 'Sanctuary' (1903); 'The Descent of Man' (1904); and 'The House of Mirth' (1905); besides 'The Decoration of Houses' (with O. Codman 1897), a rendering of Sudermann's 'Es Lebe das Leben' as 'The Joy of Living' (1902), and some uncollected stories, articles, and verse.

Wharton, Francis, American jurist: b. Philadelphia, Pa., 7 March 1820; d. Washington, D. C., 21 Feb. 1889. He was graduated at Yale in 1839, studied law, and was admitted to the bar in 1843. He was professor of logic and rhetoric in Kenyon College, Ohio, 1856-63; in 1863 took orders in the Episcopal Church and became rector of Saint Paul's, Brookline, Mass. In 1866 he became a professor in the Episcopal Divinity School at Cambridge, Mass., and also held the chair of international law in the Boston Law School. In 1885 he was appointed counsel for the State Department at Washington, and under a resolution of Congress (1888) was made editor of the Revolutionary diplomatic correspondence of the United States. His best known work is a 'Treatise on the Criminal Law of the

United States' (1846), which is accepted as a standard and has passed through many editions. Other works of his are: 'Precedents of Indictments and Pleas' (1849); a 'Treatise on Medical Jurisprudence'; 'The Conflict of Laws' (1872); 'The Law of Agency and Agents' (1876); 'Commentary on the Law of Contracts' (1882); 'Treatise on the Law of Evidence and Criminal Issues.'

Wharton, Philip, Duke of, English politician: b. December 1698; d. Tarragona, Spain, 31 May 1731. At 16 he married clandestinely and in 1716 traveled on the continent, and visited the Pretender at Avignon. That prince, gratified by his attentions, gave him the title of Duke of Northumberland. About the end of 1716 he returned to England, and thence to Ireland, where he possessed a peerage, and was allowed, although not yet 19, to take his seat in the Irish House of Peers. He obtained a British dukedom in 1718 and on attaining his majority made his appearance in the English Parliament, where he distinguished himself as the defender of Bishop Atterbury, impeached as an adherent to the House of Stuart. He also published a virulent opposition paper called 'The True Briton.' He later entered the Spanish service and in 1727 served against the British at the siege of Gibraltar, for which he was in the following year attainted. His Life and Writings appeared in 1732. Consult Robinson, 'Philip, Duke of Wharton' (1896).

Wharton, Thomas, American journalist: b. Philadelphia, Pa., 1 Aug. 1859; d. there 6 April 1896. He was graduated from the University of Pennsylvania in 1879, joined the editorial staff of the Philadelphia Times in 1883 and at the time of his death was Sunday editor of that journal. He published 'A Latter-Day Saint' (1884); 'Hannibal of New York' (1886). His short story 'Bobbo' enjoyed wide popularity and was republished, prefixed by a biographical sketch of the author by Owen Wister as 'Bobbo' and Other Fancies' (1897). 'Bobbo' was dramatized and successfully played in England.

Wharves and Wharf Construction, the modern methods of wharf construction vary but little (except as to minor details) from the methods of the ancients. The process of constructing timber piers or wharves as practised in all of the ports of the Atlantic and Pacific seaboard is as follows: Piles of the best obtainable timber (generally pine or oak) are first driven to a solid foundation into the material forming the bottom of the harbor; these are designated as standard piles and are spaced from 6 to 10 feet from centres longitudinally and transversely (see Fig. 1), according to the desired carrying capacity of the wharf. These piles are then sawed off at the proper height above the tide level and on their tops (and fastened thereto with wrought iron drift bolts) are placed timbers of yellow pine (generally) 12 inches square. These timbers are known as the caps of the wharf. On these caps are placed what are generally designated as stringers or floor beams. They are generally four inches thick and vary from 12 to 16 inches in depth, according to the load to be sustained. They are fastened to the caps of the wharf with spike-pointed wrought iron drift bolts. The stringer system is placed about 2 feet on centres on this

WHARVES AND WHARF CONSTRUCTION

superstructure; the covering planks from 3 to 6 inches in thickness being fastened with the ordinary commercial spike of requisite length. After this portion of the wharf is finished nothing remains but to protect the same, either with a system of piles driven along the side used for mooring vessels (usually called fender piles and which are fastened to the superstructure of the wharf) and are sometimes additionally protected by wearing strips of timber and plank. (See Fig. 1.) A wharf projecting out from the water front line of the harbor is generally reinforced or braced by means of brace or batter piles driven on both sides of the wharf (see Fig. 1) at an angle of about 35° with the perpendicular and they are fastened to the outside stringer as shown. The above describes more particularly, the wharves as constructed on the Pacific coast and in use in San Francisco since 1880. These wharves are 100 feet in width and about 600 feet in length.

New York Wharves.—In New York city, in wharves of the same area, contractors use about double the number of standard or bearing piles (with the exception of the four outer bents) as were used in those of San Francisco. The piles are driven 10 feet from centre to centre

tened to the before mentioned sub-caps and the other to the backing block; between these vertical fenders there are placed intermediate fenders of the same material but reaching merely between the two longitudinal fenders. In place of mooring piles there is used a cast iron mooring bit. The four outer bents of the wharves are spaced about 20 feet from centre to centre. They consist of a double row of piles, each row containing the same number of piles as are under the regular caps, or making this row of double the carrying capacity of those caps. The end piles in each of these bents and the sheathing are so arranged that they present a rounded edge to the current. This is covered for a distance of 4 feet with an armature of boiler steel one half inch in thickness and 6 feet in height, securely fastened to piles and sheathing. The wider spacing of the outer bent, the additional bracing and armature plates are for protection against floating ice. The timber for superstructure used there is what is known as hard yellow pine. The standard piles are generally of spruce and vary from 50 to 60 feet in length. The wharf timbers rarely exceed 30 feet in length.

Boston Wharves.—The ordinary wooden

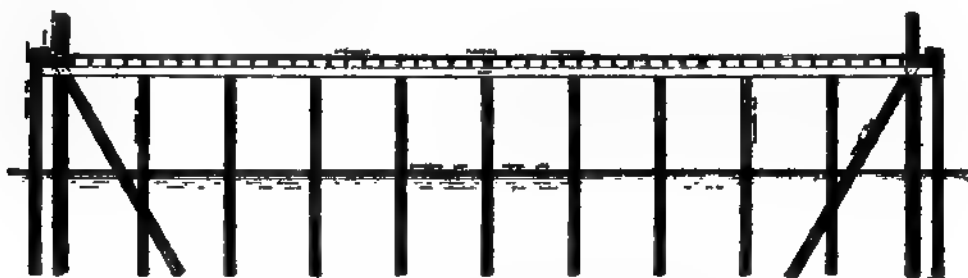


FIG. 1.—Cross Section through Ordinary Wharf.

longitudinally and about 5 feet transversely; the outer pile in each bent is cut off one foot below the grade of the balance and is capped with a longitudinal sub-cap 12 inches square. The balance of the standard piles in each bent are cut off to conform with a crown of four inches in a 60-foot wharf and are capped transversely with 12x12-inch timbers. The piles after being stayed into position, are mortised into caps having tenons $7\frac{1}{2}$ inches wide longitudinally with the caps, $3\frac{1}{2}$ inches thick and 3 inches long; the caps are also drift bolted to each standard pile with a wrought iron bolt 1 inch square. (In San Francisco, the caps are merely drift bolted to each pile with a 1-inch round iron drift bolt; no tenons are used.) The stringer system, or as they call it there, rangers, are 12x12-inch timbers, spaced 5 feet apart, or so as to come directly over each standard pile, the outside stringers being composed of two pieces. The covering of the wharf is of two thicknesses of 4 inches each. In place of fender piles, the outside standard piles are utilized for fastening vertical fenders of 8x12-inch white oak timbers, extending from the sub-caps to the line of low water; there are also two lines of horizontal fenders of 8x12-inch white oak extending the entire length of the wharf (with the exception of the four outer bents); one of these is fas-

tened to the before mentioned sub-caps and the other to the backing block; between these vertical fenders there are placed intermediate fenders of the same material but reaching merely between the two longitudinal fenders. In place of mooring piles there is used a cast iron mooring bit. The four outer bents of the wharves are spaced about 20 feet from centre to centre. They consist of a double row of piles, each row containing the same number of piles as are under the regular caps, or making this row of double the carrying capacity of those caps. The end piles in each of these bents and the sheathing are so arranged that they present a rounded edge to the current. This is covered for a distance of 4 feet with an armature of boiler steel one half inch in thickness and 6 feet in height, securely fastened to piles and sheathing. The wider spacing of the outer bent, the additional bracing and armature plates are for protection against floating ice. The timber for superstructure used there is what is known as hard yellow pine. The standard piles are generally of spruce and vary from 50 to 60 feet in length. The wharf timbers rarely exceed 30 feet in length.

wharves of Boston are constructed as follows: Standard piles, generally of oak, are driven 9 feet transversely and 10 feet longitudinally. They are bound together transversely on top with two girder caps of 6x10-inch hard pine and fastened to piles with 1-inch screw bolts; the girder caps are let into the piles so that the same are spaced 3 inches apart. The outside stringers are of 10x12-inch and all inside stringers of 6x12-inch hard pine, spaced 2 feet from centre to centre. The wharves are covered with 3-inch hard pine planks. The wharves are braced by brace piles called there spur-shores; they are of oak and are shouldered against the outer standard pile at about one foot below mean high water and fastened thereto with $1\frac{1}{4}$ inch screw bolts. In addition to bracing with piles, each bent has a set of cross-braces of 4x8-inch oak, running from a point about 2 feet above mean low water to the underside of the girder caps. These braces are fastened to each standard pile at each intersection with 1-inch screw bolts; a horizontal tie of 4x8-inch oak is also placed 1 foot above mean low water and fastened to each pile with 1-inch screw bolts. Fender piles of oak are driven in transverse lines with standard piles close up against the outer ones, and fastened thereto just below the girder cap with $1\frac{1}{4}$ inch screw bolts. The fender piles are cut off 9 inches

WHARF CONSTRUCTION.

Views of new Howard Street Wharf, San Francisco, Cal., showing the wooden cylinder pier
system of construction.

WHARVES AND WHARF CONSTRUCTION

below the top of the planking and are capped with 12 x 12-inch hard pine caps running longitudinally. These caps answer as longitudinal fenders and projecting 3 inches above the planking also as a curb or backing block. Mooring piles of oak are driven just inside of outer stringers and are held in place by 4-inch planks fitted down into adjoining stringers and around mooring piles. The corners of these wharves are similarly piled and finished as are the wharves of Philadelphia and New York. A safe load for these wharves would be about 300 pounds to the square foot.

Philadelphia Wharves.—These wharves, with the exception of two outer bents, are constructed as follows: Standard piles are, as prescribed by the rules of the Board of Port Wardens, driven in bents located longitudinally, 10 feet from centre to centre. The piles in these bents are 5 feet apart from centres transversely and before being cut off at the proper level, they are straightened and stay lathed into position. They are then bound together transversely with girder plank of 6 x 12-inch, gained into piles, equally on each side, leaving a tenon of 4 inches thick, 12 inches long and the width

stringer of 12 x 14 inches and intermediates of 6 x 14 inches laid 2 feet 6 inches from centres. They are dapped or gained out at caps 1 inch. The floor is composed of two layers of 3-inch plank, dressed to a uniform thickness; the first is laid at right angles to the axis of the wharf, and the planks are placed 6 inches apart, these spaces over the stringers being filled solid for the full width of the same. The planks in the outer section of this layer, about 12 feet in length, are creosoted with 14 pounds of dead oil to the cubic foot; they are fastened to the stringers with wrought spikes one half inch square and 7 inches long. The sheathing plank or upper layer are laid close and at an angle of 45 degrees with the axis of the wharf and are spiked to the lower plank with 5-inch wire nails averaging 3 feet apart. The backing log or curb is a 10 x 12-inch white oak timber, raised above the planking of the wharf and supported on blocking of 2 x 12 inches, laid 5 feet apart. Fender and brace piles are used only on the outer bents. The usual system of fenders is a series of 6 x 8-inch white oak timbers placed horizontally around the wharf between the top and the line of mean low water.

FIG. 2.—Cross Section through Wooden Cylinder Pier.

being the full diameter of the pile. They are fastened to each pile with two screw bolts. The cap proper is a single piece of 8 x 16 inches laid on its flat, covering the pile and being flush on each edge with the girders; they are drift-bolted to the piles and well spiked to the girder planks or clamps as they are called. The wharf is braced in the following manner: At the line of mean low water two girders of 5 x 10 inches are fastened to each pile in each bent, one on either side of the pile; the spaces between these planks and the four outer piles on each side are chocked with 12 x 12-inch timbers securely bolted to the girder plank. The bents are then diagonally braced with "A" braces of 5 x 10 on each side, making four in number, dividing the said bent into two panels, that is, a set of braces extend from the girder either way from the centre of the wharf to a point at the underside of the deck line, distant from the outside of wharf one fourth of its entire width. From the outside of wharf, at this same lower girder, another set extends to the bottom deck, and, meeting the first set, they are bolted to each pile at each intersection with galvanized screw bolts. The stringer system is composed of an outside

They are placed about 6 inches apart and are fastened to vertical furring pieces of 8 x 12-inch yellow pine which are bolted to the front row of standard piles in each bent, these piles being surfaced off to receive them. The two outer bents are constructed as to spacing, protection, number of piles and braces as are the New York wharves. They have rounded corners, white oak fender piles, and in addition, fender piles at the ends of these two outer bents; they have also brace piles and corner bands and chocks connecting fender piles.

Comparisons.—Comparing the construction of eastern wharves with those of San Francisco, leaving aside those parts in the eastern wharves which are designed to resist the floating ice, the details of the construction of the San Francisco wharves are simpler; having no gains or tenons, they are not so apt to suffer from dry rot; and the fact of having but few joints in caps and stringers, they are, consequently, in this respect superior to the eastern structures. The construction of the San Francisco wharves is, however, greatly owing to the better materials at their disposal, and for which the coast is famous. The length of timbers for wharf con-

WHARVES AND WHARF CONSTRUCTION

struction in the East very rarely exceeds 40 feet, but generally timbers up to 30 feet in length only, are specified and used. In San Francisco wharves, timbers of from 60 to 100 feet and over in length are frequently employed and are to be had with only a very small additional cost. With piles it is the same, in Eastern wharf construction; a pile 60 feet long is considered a very long pile, whereas on the Pacific coast, piles from 100 to 130 feet in length can be had at any time. The life of the superstructure of the above described wharves, especially if covered with sheds and buildings, is from 15 to 25 years, aside from the actual wear of the planking, but in sea water the life of an unprotected pile is from six months to three years owing to the ravages of the marine pests.

Marine Pests.—The most destructive of these are the *Teredo Navalis* or ship worm and

although they are sometimes less than 1-32 of an inch apart, or from the surface. The teredo enters the timber at the ground level and works upward, generally about 2 feet above low water although it will attack floating timber and I have found the wooden floats or buckets of a ferry steamer making half hour trips for 18 hours at a stretch and almost constantly in motion, completely destroyed by the teredo. It was a theory at one time that the bark on a pile was a protection against the Teredo. While this is true to a certain extent, I have seen piles taken from some of the old wharves in San Francisco Bay that were badly eaten by these worms, the bark being otherwise intact. The limnoria terebrans resembles a wood louse in appearance. It is about the form and size of a grain of wheat; it works between high and low water and is very destructive. It completely destroys the pile between the tide lines avoiding all metal fastenings and knots in the wood. The borings are so close together that the wood is completely disintegrated; ends and joints of timbers seem to be the most favorable points of attack. The protection of piles and timbers from these marine pests has been the study of engineers and scientists for many years and millions have been expended on experiments with varying success. In the direct preservation of piles proper, two methods have been followed. The first and longest in use is impregnating it with chemicals that are destructive to animal life and the second is by covering the pile with an insoluble armor or artificial bark impervious to the worms.

Creosoting.—Without doubt the creosoting process is the most valuable and efficient of all processes known for prolonging the life of timber. The process was invented in England about the same time that kyanizing and the other metallic salt antiseptics came into use; it has survived all other processes and is used to a greater extent than any other method both in Europe and this country. The creosote is derived from the destructive distillation of wood and coal and consists of oil products designated as dead oil when derived from the distillation of coal or coal tar and wood creosote oil when derived from the distillation of wood or phenic tar. The dead oil contains naphthaline, phenic or carbolic acid and other powerful antiseptics which change the chemical nature of the sap by forming therewith soluble compounds while the naphthaline rendered sufficiently fluid by preliminary heating, enters the wood cells, solidifies and becomes permanently fixed, mechanically coating and protecting the fibres against formation of fungi. The wood creosote contains paraffine, pyroligneous acid and other antiseptics. Advantages claimed for this oil are that its penetrating power is much greater and less expensive than dead oil and that it is equally insoluble in water. The limited use of this oil seems to confirm these claimed advantages but cannot be considered conclusive until more definitely established by further experience and the test of time. All experts on preservation of timber agree on one point and that is that the density of timber must be favorable to impregnation; in other words, only open pored timbers should be used for treatment with creosote, this having the least liquidity and therefore the hardest of all preservative chemicals to force into and

KYAN

STAVE
CYLINDER

FIG. 3.—Detail of Wooden Cylinder.

the *Limnoria Terebrans*. The teredo navalis is worm-shaped being from 6 inches to 14 inches in length and one fourth of an inch in diameter. It is of gelatinous nature and translucent. Its head is provided with calcareous substance or shell in two parts working on a hinge which performs the office of an auger. The head, like the body, completely fills the cavity bored and the outward appearance of the pile attacked shows no indication of the destruction going on within. Having once entered the timber it never works out nor will one cross another hole

WHARVES AND WHARF CONSTRUCTION

thoroughly impregnate the wood. The Oregon pine or yellow fir used on the Pacific coast is considered too dense to permit a thorough impregnation and if treated with creosote requires a longer steaming and a greater heat to extract the sap and open the pores and also a greater pressure to force the material into the wood. The consequences therefrom have been checking and cracking the timber making it brittle and when used for piles has checked them so extensively that the limnoria has found in and behind these cracks sheltered places in which it has done its destructive work under cover and more rapidly than when exposed to swell and current. It has also made examination of those piles more difficult as the outer shell of the pile was apparently unattacked while the inner portion of the same was entered and destroyed by the limnoria. All authorities in writing on the preservation of piles for marine work seem to ignore the existence of the limnoria terebrans. In my opinion it is much more destructive on the Pacific coast than is the teredo and while a pile that has been thoroughly creosoted will resist the teredo, even if somewhat checked, the limnoria will find the slightest opening and destroy the pile. There have

substantial. Another protection against these marine pests is what is known as the built pile; it consists of a pile built up from a core of 6 x 6 with 1-inch boards until the same forms a pile 12 inches square, each layer being tarred and sanded. It is built on the theory that the teredo is loath to cross a seam and the test pile taken from Section I. of the seawall, a particular feeding ground of the teredo, after 10 years' immersion, verified this theory. But this was a case of again ignoring the ever active limnoria and piles built since have shown that the limnoria found a home in the seams of the boards of which the pile was constructed. However, an improvement was made in the details of construction, at my suggestion, which has resulted in keeping the limnoria out, and that was the placing of ship felt between the last two layers of boards from high water to 2 feet below low water (limnoria working only between high and low water). The result has been quite satisfactory, although I think that a time test of a large quantity of piles is the only satisfactory one. In many of the government piers where the teredo and limnoria are particularly active, numerous iron piles have been used, both wrought and cast. These are

FIG. 4.—Side Elevation.

been several methods for the preservation of piles in San Francisco harbor by means of an exterior covering or artificial bark, some of which have been more or less successful, the success depending upon the durability of the covering, or, in other words, the life of the pile is the life of the artificial bark. The one making the best showing, from the fact that it has been the longest in use, is what is known as the Paraffine Paint Company's method. It consists of a covering of P. & B. pile covering, covered with battens which have been treated with P. & B. paint. I think the secret of the success of this process is the fact that it is applied cold. Previous coverings of this character having been applied hot to a wet pile, no adhesion was obtained between covering and the pile for the reason that the hot material draws the moisture to the surface. This difficulty claims to have been avoided by the parties using what is known as the Perfection Process, by kiln-drying the piles before covering. Said process consists in covering the piles spirally with a double thickness of burlap treated with asphalt, the application or winding of the burlap being done by means of a large lathe in which the piles are turned. This covering has not had sufficient time test to pass on its merit, although it looks

prohibitory in many places for the reason of the excessive cost of the material and construction, most of the piles having either to be screwed into the bottom or driven with a water jet. Another objection is the rapid destruction by oxidization of the joints in the bracing system.

Cylinder Construction.—A mode of construction which has been very successful on the Pacific coast was invented by the writer and has been in use in the San Francisco harbor for the past ten years and has not as yet shown any latent defects. It is what is known as the wooden cylinder pier construction. (See Fig. 2.) The foundation proper consists of cylinders of concrete and piles placed about 15 feet on centres. The details of construction are as follows: The core consists of one or more piles, generally three; these are driven to a firm foundation and are left at different heights from the finished top of the proposed wharf, for example, say one pile is 30 feet in length, one 55 feet and one 60; this is for two reasons: first, for economy, as in the San Francisco Bay most of the piles depend absolutely on the friction of the mud for sustaining purposes (there being no known bottom) and it will readily be seen that the 50-foot piles will be as deep in the mud as the 60; secondly, it admits of a larger body of

WHAT CHEER—WHATELY

concrete at the top of the cylinder where required. After this cluster of piles is driven, there is then driven over and encircling same a wooden stave cylinder, generally four feet inside diameter; these staves are from 3 to 4 inches thick and bound together with wrought iron hoops having adjustable lugs; these hoops are placed about 2 feet on centres and the cylinder is made perfectly water tight. It is driven with an ordinary pile driving machine to from 10 to 15 feet into the mud. The water and mud in the interior is then pumped out to a depth of from a foot to 5 feet below the mud on the outside; then inside of this cylinder of wood, between it and the piles, is placed an interior cylinder of expanded metal or similar metallic interstitial web about 1 foot less in diameter than the interior of the wooden cylinder. The interior is then filled with a rich concrete of hydraulic cement and broken rock. The cylinder pier is complete and forms a teredo proof concrete pier, having a wooden core reinforced with an interstitial web of expanded metal and protected for at least four years with an iron bound wooden jacket. (See Fig. 3.) These cylinders are then capped with caps of structural steel, generally two 15-inch I beams and the balance of the superstructure is as in the ordinary wharf. The fender system is somewhat different from that in general use and is as follows: The fender piles are driven in pairs about 10 feet apart and about 1 foot away from the wharf proper; they are connected together longitudinally with a ribbing composed of three timbers both at the surface and below the top of wharf. (See Fig. 4.) Between these fender piles and the outside stringer are placed a nest of heavy spiral springs similar to those used on a buffer in a freight car. This is the only direct connection between the wharf proper and the fenders; the upper ribbing at the surface of the wharf acts in the dual capacity of a curb for the wharf and a support for the fender line. This spring fender line saves the jar to both vessel and wharf and in ordinary choppy weather there is not the slightest motion to the wharf; it also saves the wear on the fender piles as these last but from one to two years, due to wear and breakage. For example, in pier No. 12, San Francisco, used by the United States transport steamers, the fender piles with the spring system have been in use since 1896 without a single renewal, while at pier No. 4 used by steamers of half the tonnage, all the fenders have been renewed twice in that period of time. There are at present constructed in San Francisco harbor and in course of construction, seven of these wharves 100 feet wide, 600 feet long, and six wharves 120 feet wide and 800 feet long, aggregating a cost of \$1,000,000, and also at Long Beach, Cal., near Los Angeles, a double deck pleasure wharf costing \$100,000. The cylinder pier system construction has been used by the Santa Fe System, the North Shore Railroad Company, and the San Francisco, Oakland and San Jose Railway Company, and is to be used by the Pacific Mail Steamship Company in the construction of four new piers. See Dock; Pier.

HOWARD C. HOLMES,
Chief Engineer, San Francisco Dry Dock Co.

What Cheer, Iowa, city in Keokuk County; on Coal Creek, and on the Chicago & N., and the Burlington, C. R. & N. R.R.'s; about 70

miles southeast of Des Moines. It is in an agricultural and coal mining region, and has several industries connected with farm and dairy products. It has six churches. The two banks have a combined capital of \$80,000. Pop. (1880) 719; (1890) 3,246; (1900) 2,746; (1910) 1,720.

What-cheer, in Rhode Island, a watchword or shibboleth, derived from the fact that the Indians of the colony thus greeted Roger Williams and his companions, when they first landed on the Sekonk River near the present site of Providence.

Whatcom, hwô't'kôm, Wash., city, county-seat of Whatcom County; on Bellingham Bay, and on the Great Northern, the Northern P., and the Bellingham Bay & B. C. R.R.'s; about 79 miles north of Seattle. It has an excellent harbor, and steamer communications with the Puget Sound and the Pacific ports. A State road extends over the Cascade Mountains, across the Mount Baker Pass, to the gold and silver mines and to the grazing lands on the Columbia River. Four miles from the city is the Corn-wall coal mine. The water-supply (gravity system) is obtained from Lake Whatcom, four miles distant. The city has a good sewerage system, electric-light plant, and electric railway. The court-house, city hall, schools, and churches are the principal buildings. It has the State Normal School, a high school, graded elementary schools, and a library. The three banks have a combined capital of \$215,000 and deposits amounting to over \$1,250,000.

In December 1890 the old city of Whatcom and the town of Schome were consolidated and called New Whatcom. In 1903, New Whatcom and Fairhaven were consolidated under the name of Bellingham. Pop. (1890) Whatcom, 4,099; Schome, 2,700; Bellingham (1910) 24,298.

Whately, hwât'li, Richard, English prelate, Archbishop of Dublin: b. London 1 Feb. 1787; d. Dublin 8 Oct. 1863. He was educated at Oriel College, Oxford, and in 1819 made his first appearance as an author by publishing his since famous 'Historic Doubts relative to Napoleon Bonaparte.' This pamphlet is among the most popular of the author's writings, more than 12 editions of it having been published. Its object is to show that objections of the same kind as those brought forward by skeptical writers of the truth of the gospel narratives, founded on apparent inconsistencies and absurdities in these narratives, may be brought against any well known and incontrovertible piece of history, such as that of Napoleon Bonaparte. In 1822 Whately delivered the Bampton lectures at Oxford, 'On the Use and Abuse of Party Feeling in Matters of Religion.' The same year he received the living of Halesworth in Suffolk, and was appointed principal of Saint Alban's Hall, Oxford, in 1825. In 1825 he published 'Essays on Some of the Peculiarities of the Christian Religion' (7th ed. 1860). A second series of essays 'On Some Difficulties in the Writings of Saint Paul and in Other Parts of the New Testament' appeared in 1828 (6th ed. 1849); and a third series, 'The Errors of Romanism traced to their Origin in Human Nature,' in 1830 (5th ed. 1856). In 1825 was published perhaps the most widely known of his works, 'The Elements of Logic,' and the scarcely less popular 'Elements of Rhetoric' in 1828. Both have passed through many editions, and like all his

WHEAT

writings are marked by force of style, clearness of arrangement, and homely yet felicitous illustration. Whately was appointed professor of political economy in 1830. The lectures he then delivered were afterward published under the title of 'Introductory Lectures on Political Economy.' In Oxford Whately stood in the front rank of those who held liberal views in ecclesiastical and social matters, and among these his earnest love of truth, his contempt for arguments resting solely on tradition, and the keenness of his logic, gave him great influence. By his theological and other writings, and by the part he had taken in political affairs, especially the support he had given to the Catholic Emancipation measure, his name and abilities became well known, and 1831 he was appointed archbishop of Dublin and bishop of Glendalough. The cause of national education in Ireland he warmly embraced, and for 20 years was an active and influential member of the board. But in 1853, Dr. Cullen and the Roman Catholic party having objected to a treatise on the 'Evidences of Christianity,' composed by Whately, and used in the schools, and having procured its withdrawal, the prelate resigned his seat at the board. Whately was distinguished by honesty, love of truth, and princely liberality. In manner he was somewhat rough and careless—the reaction, as he said, from the painful sensitiveness with which he had been troubled in his youth. His conversation was rich in joke, and pun, and witty repartee; and he was fond of trapping and puzzling his opponents by logical quibbles, though no man could be sharper in detecting a fallacy in another's reasoning. Consult 'Life and Correspondence of R. Whately, D.D.' by his daughter, E. J. Whately (1866).

Wheat. Wheat belongs to the Hordeæ tribe of the Gramineæ or grass family. There are four principal kinds or sub-races: common wheat (*Triticum sativum vulgare*), Egyptian and English wheat (*Triticum sativum turgidum*), flint wheat (*Triticum sativum durum*), to which the durum and macaroni varieties belong, and a dwarf variety (*Triticum sativum compactum*), supposed to have been the kind produced in ancient times. Each sub-race is in turn divided into many varieties. The wheat most generally cultivated and in most common use for bread purposes is *Triticum sativum vulgare*, although varieties of durum and spelt are extensively grown in some localities.

Wheat is of ancient origin and was cultivated by prehistoric races, as the Swiss Lake-Dwellers. In the earliest writings it is mentioned, and samples which are not materially different from similar modern varieties have been found in a fair state of preservation in ancient tombs. Attempts have been made to germinate this "mummy wheat," but without success. The Chinese claim that wheat was used by them as food 2,700 years before the Christian era and in Egypt its use as food appears even to ante-date this period. A number of varieties have been cultivated from early times, as spelt, durum, and winter and spring varieties of *Triticum sativum vulgare*. Wheats produced in different countries have been subject to different climatic and soil conditions as well as to different methods of cultivation until material changes have taken place and numerous hard and soft varieties have been produced. There

appears to be no authentic record of wheat growing wild and sowing itself without the help of man.

The world's wheat crop normally amounts to about 2,720,000,000 bushels, of which the European countries produce a little more than half. At present the United States is the greatest wheat growing country. In 1901 the yield was over 720,000,000 bushels. There are large wheat areas in the northwestern possessions of British North America which have not yet been brought under full cultivation. This will increase the wheat producing belt of North America by adding a strip about 1,500 miles long by 300 miles broad. There also are large undeveloped wheat regions in South America, particularly in the Argentine Republic, and it is claimed that some parts of Siberia are suitable for wheat production. Thus it is evident that there are vast areas of fertile virgin soil yet to be brought under wheat cultivation.

Wheat can be grown on a variety of soils. It thrives best, however, and produces largest yields upon rich alluvium, and soils formed from different kinds of rock thoroughly disintegrated and mixed with vegetable mold. The wheat soils of the northwestern wheat region of the United States are largely of glacial formation and composed of clay and silt with small amounts of fine sand and containing liberal amounts of alkaline matter, particularly disintegrated limestone. The best wheat soils are rich in humus (decaying vegetable matter), which through decay supplies nitrogen, one of the principal elements used by the wheat plant for the formation of gluten. The chemical composition of a wheat soil of high productiveness from the Red River Valley of the North is as follows:

	Surface per cent	Sub soil per cent
Insoluble matter	47.64	41.41
Soluble silica	15.43	8.37
Potash	0.54	0.25
Soda	0.45	0.48
Lime	8.44	7.45
Magnesia	1.85	4.48
Iron oxid	4.28	3.48
Alumina	7.89	10.72
Phosphoric anhydrid	0.38	0.17
Sulphuric anhydrid	0.11	0.10
Carbonic anhydrid	2.42	14.26
Volatile matter	15.55	6.22
Humus and volatile matter ..	5.34	0.89
Nitrogen in volatile matter ..	0.38	0.11

The tendency in wheat farming upon new soils has been to grow the crop for a number of years without practising rotation or using fertilizers. After a time this results in reduced yields and an inferior crop, due in part to the loss of nitrogen from the land. Wheat does not remove a large amount of gross fertility from the soil, but exclusive wheat culture on virgin soil causes a rapid decay of the humus and a consequent loss of nitrogen, one of the elements of which humus is composed. When wheat is grown along with other farm crops in a good rotation and manures are intelligently used the wheat does not have an exhausting effect upon the soil.

The yield of wheat ranges from 10 bushels and less to 30 bushels and more per acre. In countries where land is expensive, and intensified farming is practised, the yield per acre is

WHEAT

generally larger than in new regions where more land is available. The yield per acre of wheat in the United States is much less than the soils are capable of producing.

Formerly plowing was done with a bent stick or wooden plow, the wheat was sown broadcast by hand, the crop was cut with the cradle and bound in sheaves by hand, and finally thrashed with the flail or by the trampling of horses. Improvements in machinery, as steam and gang plows, seeders, reapers, self-binders, and thrashers, have greatly reduced the cost of production and increased the world's supply of wheat. Equally as great have been the advances in transportation, storage and milling facilities. Wheat is now transported in specially constructed freight cars and boats, and stored in large elevators in which 120,000 bushels are placed in one compartment, when formerly it was often transported on horse or mule back in bags, loaded and unloaded by hand and stored in small bins in granaries. The milling process has developed from crushing between two stones to reduction by steel rolls.

Wheat is subject to a number of diseases, as rusts, smut, and other vegetable parasitic diseases, many of which have been studied and are now in part capable of being controlled. The smuts are destroyed by treating the seed wheat with chemicals which kill the smut spores, while the rusts are held in check by destroying the host plants, as the barberry, upon which the parasite spends part of its cycle of life. There are a number of insect pests which often cause great destruction of the crop, as grasshoppers, frit flies, Hessian flies, and chinch bugs. Economic entomologists have done much to save the wheat crop from insect ravages.

The wheat kernel is surrounded by a seed pod composed of cellulose which constitutes the outer layer and is called the pericarp. The second covering or epispem, which is just within the pericarp, consists of the outer and inner integuments. The perisperm or third bran layer is a thin mass of collapsed cells. The aleurone layer—so-called gluten cells—is composed mainly of nitrogenous matter and lies within the three-bran layers. The endosperm or floury portion constitutes about 80 per cent of the wheat kernel and is within the three-bran layers and aleurone cells. The germ or embryo plant is stored in the lower part of the kernel where its outline can be traced by the indentations. The germ makes up about 6 per cent of the kernel, the bran layers about 10, while about 86 per cent is present in the aleurone and endosperm. The relation of the different parts, one to the other, as bran to endosperm, varies in different kinds and varieties of wheat, some producing a larger amount of flour than others and some more bran.

The character of the wheat, as starchy or glutinous, is determined largely by soil and climate. A short, forcing growing season and a fertile soil have a tendency to produce glutinous wheat, while the opposite conditions produce starchy wheat. When hard glutinous seed wheat is sown in regions which produce starchy soft wheats, the hard wheat gradually changes its character and in about two years becomes starchy. Whether a wheat is hard or soft depends upon the amount and character of its gluten. Hard wheats usually contain over 12 per cent gluten, of which 55 to 65 per cent is in

the form of gliadin, an alcohol soluble proteid, while soft wheats contain less gluten, but gluten of a higher gliadin content. See article on **BREAD AND BREAD MAKING** for influence of gluten on quality of bread.

Extensive experiments have been performed by Lawes and Gilbert of Rothamsted, England, to determine the influence which different kinds of fertilizers have upon the wheat crop. They have shown that fertilizers influence the yield more than the composition of wheats and that it is not possible by means of fertilizers alone to materially increase the amount of starch or gluten. Climatic conditions effect the composition to a greater extent than do fertilizers. Wheats grown upon the same soil in different years show greater variations in composition than wheats grown the same year but differently fertilized.

Different varieties of wheat when grown under the same conditions are fairly constant in composition. In protein content, wheats range from 8 to 18 per cent. The most nitrogenous wheats do not necessarily make the most glutenous flours, as frequently a large portion of the nitrogen is in the germ and offals.

The grading of wheat is based entirely upon the physical qualities as weight per bushel, color, and plumpness. Smut and blemishes, caused by unfavorable climatic conditions, are also considered in grading wheat. When new wheat is stored in elevators, a slight fermentation change takes place known as "sweating." If the wheat is sound this change is slightly beneficial for flour production, as it increases the keeping qualities of the flour. Unsound wheats, as those which are bleached, frosted, immature and sprouted, usually have a somewhat different composition from fully matured wheat. Such wheats usually contain a larger amount of soluble proteids, soluble carbohydrates, and organic acids than normal wheats. Damaged wheats generally yield a smaller amount of flour as well as flour of poor keeping qualities.

It is not possible to make accurate comparisons as to composition of wheats grown in different countries. It will frequently be found that wheats grown in different localities of the same country vary as much in composition as do wheats grown in different countries.

Wheat contains slightly more protein and less starch than corn, oats, rye, or barley. Oats from which the hulls have been removed contain more protein and fat than wheat. The difference in composition between wheat and the other cereals is not large and occasionally individual samples of corn or rye will be found containing more protein than individual samples of wheat. Wheat differs in composition from all other cereals in that its gluten is composed of the two proteids, gliadin and glutenin. This gives flour its bread-making value. No other cereal except rye contains a gluten that is capable of expanding and forming a light porous loaf. Because of its unique composition no other cereal can take the place of wheat for bread-making purposes.

Numerous experiments have been made to improve the quality of wheat by selection of seed, and by breeding and crossing of standard varieties. Wheat responds readily to such tests, but unless great care is taken it as readily reverts to its original condition. In the United States two main classes of wheat are produced,

BREEDING NEW WHEATS.

TESTING NEW WHEATS IN THE LABORATORY.

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WHEATEAR—WHEAT INSECT PESTS

namely: winter and spring wheat, of which there are a number of varieties, as white and red winter wheat, Oregon Club, Blue Stem, Scotch Fife, etc. Minnesota, North and South Dakota, and northern Iowa constitute the main spring wheat region; spring wheat is, however, grown in other localities.

The wheat plant assimilates its mineral food and nitrogen from the soil at a rapid rate. In the case of spring wheat, by the time the crop is half grown, over three fourths of the mineral food and nitrogen needed for construction purposes have been taken from the soil. Wheat is not a strong feeding plant and taking its food from the soil in so comparatively short a time, the soil must be in a high state of productiveness in order to yield a good crop. The wheat plant needs greatest assistance in securing its nitrogen, hence fertilizers for wheat should be nitrogenous in character. Wheat also needs a good supply of available mineral food as phosphoric acid and potash, but is better able to secure these elements from the soil than it is nitrogen.

The flour yield of wheat is determined approximately from the size and weight of the kernels. According to Foster, the weight of 100 average kernels can be taken as the basis for estimating the flour yield:

WHEAT KERNELS	Weight troy grains	Contains per cent of flour
100	46	74.1
100	44	73.6
100	42	73.2
100	40	72.6
100	38	71.8
100	36	71.0
100	34	70.3
100	32	69.6
100	30	68.7
100	28	67.6
100	26	66.8
100	24	66.0

Because of its usually high price, wheat has never been extensively used as animal food, but at times when it has been cheap and abundant, it has been used for the feeding of all farm animals and has proven equally as valuable as other grains for the production of beef, pork, mutton, and milk. In the feeding of wheat to farm animals, the best results are secured by coarsely grinding or pulverizing the grain instead of feeding it whole. The main use of wheat, however, is to manufacture flour for human food. It is used more extensively as human food than any other cereal.

HARRY SNYDER,

Professor of Agricultural Chemistry, University of Minnesota.

Wheatear, or Fallow-chat (*Saxicola eximie*), an European terrestrial warbler, allied to the stonechat. Its average length is 6½ inches, and its color is gray above, the wings being tipped with black; a black streak encloses the eye and ear-coverts. The breast is brown and the under parts white. The wheatear is much sought after when in good condition as a table bird, its flesh being very delicate and is usually caught in traps. By the British peasants the wheatear's presence is regarded as a sign of ominous and unfavorable kind; and probably the fact of the nest being often found in collections of old stones in burial-places has tended to in-

crease the superstitious feeling. The nest is buried deeply among stones or in rock-clefts, the eggs being of pale-blue color, and numbering from four to six.

Wheat Insect Pests, insects injurious to growing wheat-crops. These number from 50 to 100 different kinds in the United States alone, many of which have been imported from the Old World; and they represent a wide variety of forms and classes. The most important, probably, are flies, more or less closely related to the house fly and mosquito; and of these the Hessian fly is the most dreaded and widespread. This is a small fly (*Cecidomyia destructor*) of the family *Cecidomyiidae*, the larva of which is very destructive to wheat, barley, and rye, but does not attack oats. It is named from the unfounded belief, that it was brought to America from Europe (where it is native, and has been a pest for centuries) in the baggage of the Hessian mercenaries employed against the Americans in the war of independence. The female fly is about a tenth of an inch in length. Its body is brown, with the upper parts, the thorax, and the head of a darker shade, approaching to black. The wings are dusky gray, and are surrounded with fringes. The male is somewhat smaller than the female, and has longer antennae. The female flies usually lay their eggs on the young plants twice in the year, in May and September, the maggots being hatched in from 4 to 14 days. These work themselves in between the leaf-sheath and the stem, and fix themselves near the lowest joints, often near the root, and suck the juices of the stem, so that the ear falls down at a sharp angle. These maggots turn to pupae ("flaxseed") from which the flies develop in about ten days; those of the fall brood hibernate in the pupa state, and are ready to begin their depredations with the early sprouting of the spring crop. In view of these habits, wherever the presence of these insects is known or suspected, the winter wheat should be planted as late as possible, or the early planting of a "trap" strip at one side of the field. In this the flies will lay their eggs, after which the strip may be plowed under and the young destroyed; volunteer wheat should be destroyed and stubble burned.

Other true flies attacking wheat and other grain-crops are mainly of the family *Osciidae* which contains a large number of species of variable habits, those of interest in the present connection mainly inhabiting the stems of grains and grasses. Here belongs the frit-fly of Europe, so terribly destructive both in Great Britain and on the Continent, and many species in this country whose depredations are insignificant or local or obscure. That one of most consequence, and most thoroughly studied is the "wheat bulb-worm" or "wheat stem-maggot" (*Meromyza americana*), which has been a constant evil ever since civilized agriculture began here. It is a native of the whole of North America, apparently, originally feeding on the wild grasses. In the middle latitudes of the United States three annual broods develop; there are more farther south, but only two in Canada. The life-cycle of this insect within the wheat-belt of the United States, according to Webster, is as follows: The winter is passed in the larval stage, and the short pupal stage coming in May brings the emerging of the adults

WHEAT STARCH

at the time when the female is able to place her eggs on the plants where the young, on hatching, will make their way to the tender and succulent stem just above the upper joint. By the time the straw has ripened the larvae have ceased to require food, and pass through the pupal stage, the adults of this brood appearing in July. Eggs are now deposited in volunteer wheat and grass, and, owing either to the retarding effects of meteorological influences or a diversity of food of the larvae or both, perhaps, the emerging of the adults is prolonged throughout a period extending from late August through September until late October. At this period the fall wheat offers a decidedly inviting plant to the female fly on which to place her eggs with a prospect of her progeny having an abundant food supply. It is the larvae from eggs deposited during this period that winter over in the plants and give rise to the May-June generation of flies. It is this last brood that is of more especial interest to the farmer, as it is very seldom that the pest does serious injury to grain except in fall and early spring. The effect on the plant is this: in young plants the central spindle-shaped enfolded leaf is killed, the detached portion turning first yellow and later brown, then shriveling up and dying, leaving the outer lower leaves uninjured. In Hessian-fly attacks this spindle-shaped leaf is absorbed and does not appear at all in young wheat in autumn, so that there need never be any confusion of the work of these two insects in fall wheat, and the effect on the full-grown straws is even more easily distinguishable. When attacked by the maggots of this species the fully grown straw withers at the upper joint, and all that portion of the stem including the head, the sheath excepted, changes to a whitish color, the remainder of the plant, including the upper sheath, continuing uninjured and of the usual green color. The Hessian fly never affects the full-grown straws in this manner and the lesser wheat stem-maggot (*Oscinis carbonaria*) does so but rarely, so that the presence of these maggots in the straw can be easily detected shortly prior to harvest by their whitened color from the upper joint upward. The larvae are within the stem and not outside and under the sheath, as with the Hessian fly; they are larger and of a more glassy green color than those of the lesser wheat stem-maggot, and it is only when still very young that the ordinary farmer need ever mistake them for any of the others mentioned in this article. The liability of attack from this insect is not sufficiently great to warrant expensive preventive measures. It occasionally comes in vast numbers, but no way is yet known of foretelling these epidemics. The same precautions and methods as those taken against the Hessian fly are recommended. Several other species of *Oscinis* are known, among which the American frit-fly (*O. soror*) may prove formidable hereafter, as it has already committed extensive depredations in Minnesota. The more careful and cleanly the method of farming, the less are these and other insect pests to be dreaded.

The chinch-bug is another far too prevalent plague of grain-fields; it is, indeed, regarded as the most destructive insect in the country. It is a small blackish plant-bug (*Blissus cucumeris*), with white wing-covers each marked with a dark line like a figure 6. Arising from her winter sleep in the old grass and rubbish of the

fields and fence-corners, the female lays several hundred eggs on the stems and roots of the sprouting grasses and grains near her. The young hatch quickly, and in a crowd of reddish dots suck out the juices of the growing plants, causing them to wither and die. There is another brood in the fall. Severe winters and wet and cold springs reduce the numbers of this pest, and certain diseases are known which spread among the bugs and destroy them. Infected bugs have been sent from diseased districts to other regions and imparted to the bugs there with good effect. There seems to be no preventive, however, except great care in burning stubble and rubbish, keeping the fields clean, and planting as late as possible.

Another group of highly injurious insects is found in the family *Chalcididae* (q.v.),—a family of gall-flies with one genus (*Isosoma*), whose species prey upon growing plants of this kind and are called "straw-worms" or "joint-worms," because their larvae attack the nodes or "joints" of the grain-stem. The species of special interest as affecting wheat is *I. grande* (or *I. tritici*). This gall-fly is about an eighth of an inch long and black, with a body shaped much like that of an ant and four dark wings. When, in the spring, the young wheat plants are only starting to throw the stem upward, the females (at that time minute and wingless) push their ovipositors through the stem until they penetrate the head of the embryo plant within and leave an egg there. The larva soon hatching devours this vital part of the plant and kills it, though the stem may continue to grow for some time. By the middle of June the young have developed and cut their way out to appear as the adult summer form, which wander widely. These mature, winged females now deposit eggs within the stems of wheat just above the uppermost joint, where a hardy woody gall forms about the larva, within which it transforms into the pupa stage and stays on, inert, through the winter. The best preventive measure is an annual rotation of crops; next to that the burning of the stubble, purposely left long, but this must be done not later than early September. Various other species of *Isosoma* attack other grains, especially barley and rye, and some others also injure wheat.

Purples, ear-cockle or peppercorn is a disease of British wheat, produced by a minute nematoid worm called "wheat-eel" (*Vibrio tritici*), which are placed by their parents in the germ of the seed, and cause the formation of the purplish-black galls or "cockles" which are a feature of the disease, and in which the worms are contained. When fully grown they may attain a length of a quarter of an inch.

The Department of Agriculture has issued a large number of special illustrated publications upon the insects injurious to wheat and other grains, which should be consulted. Prominent among them are Marlatt, 'The Principal Enemies of Growing Wheat' (1901); Webster, 'Insects Attacking the Stems of Growing Wheat,' etc. (1903); Osborn, 'The Hessian Fly in the United States' (1898); Webster, 'The Chinch-bug' (1898).

Wheat Starch. The history of wheat starch dates back to the ancient Greeks and Egyptians. They evidently understood its qualities and experimented with various kinds of

WHEAT STARCH

wheat. Pliny speaks of starch made by the inhabitants of the island of Chios with the remark that starch made from summer wheat was preferred. They used it for medicinal purposes and for food. In Continental Europe wheat constituted the principal source of starch for centuries. It was heard of in England as early as 1511, but not much used until about 1564. In Queen Elizabeth's time its use was made popular for stiffening those enormous ruffs so much worn at that time, and as a powder for the hair. According to Planché, "Mistress Bingham Vandt Plasse, a Fleming, came to London and publicly taught the art of starching"—Stubbs falls foul of this "liquid matter which they call starch, wherein the devil hath learned them to wash and dive their ruffs, which being dry will then stand stiff and inflexible about their necks." During the reigns of Queen Anne, and the Georges I., II. and III. and until 1833, to use any other substance was prohibited under severe penalties, restrictions and taxes. As the cotton factories of England and France were built, the demand for wheat starch accordingly grew.

In the United States small factories sprung up in different places about the beginning of the last century. In 1803 a patent was granted to J. Naylor, by which he made spirits from the wash-water obtained as a by-product in the manufacture of wheat starch. Another patent was granted in 1810 to E. Perkins of Shrewsbury, N. J., on a process for making starch from wheat, and spirits from the residuum. In 1829 Stephen Liversidge purchased a water power mill at Dorchester, Mass., and made wheat starch for the New England cotton mills. He was prosperous, and in 1841 added steam power. He continued until 1855, when his factory was destroyed by fire and was never rebuilt. Other factories were built at Roxbury and at Watertown, Mass. At the latter place it was made mostly for family use, and put up in boxes holding 48 pounds each. This is the only one of the early factories still in existence, and is conducted by the firm, H. Barker & Co., of Boston, Mass. In 1842 Thomas Kingsford was the superintendent of a wheat starch factory belonging to W. Colgate & Co. of Jersey City, N. J., and experimented with corn as a material for making starch. His success led to his establishing the first corn starch factory at Oswego, N. Y., in 1848. Up to this time wheat starch was the principal kind sold by grocers. At present the various brands sold for family use are all made from corn, although starch made from wheat is superior both for culinary and for laundry purposes. At normal conditions of the market wheat starch costs about twice as much as corn starch. Being considered expensive its use is therefore confined to doing the best quality of work, and is used by experts who understand its superior qualities. For the finishing of cotton and linen textiles and as a carrier of colors in printing cotton goods, the best results and the finest effects are obtained by its use.

When examined under a microscope the granules are small and are found to differ greatly in size, varying from 0.05 to 0.01 m.m. in diameter, actually showing two classes of granules both of them shaped like circular disks. It is characterized by certain qualities which do not belong to either corn or potato starch. It enters the fabric and forms a body within instead of a coating on the outside, thus mak-

ing it possible to get a better finish and show the clean, clear texture of the goods. It adds weight by filling the meshes, and is tough and flexible. It better resists moisture and perspiration. Being possessed of these qualities it is thoroughly adapted to doing fine laundry work, and is in fact indispensable to the manufacturers of collars, cuffs, and shirts in laundering their goods which is more difficult the first time. Many laundrymen try to cheapen the cost by using other starch. This is readily detected by observing that the collars and cuffs break to form joints and do not possess the qualities mentioned above. The modern laundry industry is a growing one and the foundation for its finest work is wheat starch. In 1891 the Crystal Springs Company of Watertown, Mass., discovered that the penetrating quality of starch could be increased by partially dextrinizing it. This was the first of the "thin boiling" starches, which have been in considerable demand since.

The consumption has gradually increased from year to year until the amount used in this country is about 18,000,000 pounds, requiring annually about 700,000 bushels of wheat for its production. None is exported. The factories are scattered through the East and Middle West.

In the manufacture of starch from wheat as well as from other cereals, it is necessary to loosen the particles of the grain by disintegration so as to break up the cellular tissues. When this is accomplished it is not difficult to separate most of the granules which are thus laid bare by simply washing them out with water and breaking them loose from the other substances. A part of the starch in wheat is in a very close mechanical combination with some of the gluten, and is not easily separated. This glutinous starch is considered to be a compound of the unripe or undeveloped starch and gluten substance. If the process is complete, the three principal products obtained are starch, gluten, and gluten starch. There are three processes in use in this country. By acidulous fermentation of the wheat, by the fermentation of flour and by treating flour mechanically, in which the gluten is separated without either chemicals or fermentation. Most manufacturers employ the old fermentation process, which is cheaper and enables them to use unsound or weak flour, which can be purchased at low prices. The gluten is washed away as it ferments, leaving the starch at the bottom of the tanks. By repeated washings it becomes freed from other substances and is allowed to settle. It is then cut into cakes and placed into drying chambers to crystallize and dry. For the past years the writer has been making wheat starch by a process in which all the products are saved. The flour is placed in machines which wash out the starch and gluten starch together under a constant flow of water leaving strong, elastic gluten (q.v.) by itself. This being perfectly fresh and sweet, is dried by a special process, ground into flour, and put on the market as Gum Gluten. An average of only 16 pounds of dry gluten is retained from a barrel of flour. The demand is mostly from those suffering from diabetes mellitus and such as are selecting a vegetable protein instead of too much meat. The dietetic value of gluten has been recognized by scientists for years, and it is to be regretted that a loss of such a valuable food

substance has been going on for centuries. The gluten starch together with the starch runs from the washing machinery as a milky liquid into wooden tanks, where it is allowed to settle. The heavy starch particles go to the bottom, while the gluten, having less specific gravity, forms a layer on top, and the water which forms the greatest bulk can be drawn off. In appearance the gluten starch is gelatinous and somewhat darker than the starch. It has not been considered of any great commercial value and has been allowed to run away with the water. In 1902 the writer took out patents for making it into a dry powder that turns to a wet adhesive paste by mixing with cold water. It is known on the market as "Jellitac," and is used for sticking on labels, for hanging wall-paper, for bill-posting and wherever wet paste is used. In thus making use of the by-products, especially when they have a superior value, is in a national economical sense, an attainment of the highest importance. For references read the United States Census Bulletin (198), published in 1902, United States Patent Reports and Histories of Manufacturers by Clapp and by Bishop. See STARCH.

ARTHUR S. HOYT,

Manufacturer of Wheat Starch, New York.

Wheatland, a famous estate and former residence of President James Buchanan, located a mile from Lancaster, Pa.

Wheatley, hwét'li, Francis, English painter: b. Wild Court, Covent Garden, London, 1747; d. London 28 June 1801. In early life he carried off several premiums given by the Society of Arts and was employed by Mortimer in decorating the ceilings at Brocket Hall. He set up as a portrait painter at Dublin, and was much employed on small whole-lengths, among his sitters numbering many members of the Irish House of Commons. Becoming involved in a scandal he left the Irish capital for London and between 1765 and 1783 exhibited many pictures classed as "domestic," but his works also included the 'Riots of 1780,' the original of which perished in a fire, although Heath's engraving of it gives a good idea of the work. As a contemporary of Morland he was superior to that painter in the refinement both of his subjects and his treatment of them, and was really masterly in his handling of equestrian portraits, such as 'The Second Duke of Newcastle and a Shooting Party.' He was elected R.A. in 1791. He is an important figure as being one of the founders of English rural genre, and painted pretty and graceful rustic figures of women and children, while his sense of landscape coloring was really exquisite.

Wheatley, Henry Benjamin, English philologist and bibliographer: b. Chelsea 2 May 1838. He was clerk to the Royal Society 1861-79, honorary secretary to the early English Text Society 1864-72 and its treasurer 1872-1901. Besides editing for the Text Society 'The Romance of Merlin' (1865-99) and other works he is the author of 'Anagrams' (1862); 'What is an Index?' (1879); 'Samuel Pepys and the World he Lived In' (1880); 'How to Form a Library' (1886); 'London Past and Present' (1891); 'Literary Blunders' (1893); 'Historical Portraits' (1897); etc.

Wheatley, Phillis, American-African verse writer: b. Africa about 1753; d. Boston 5 Dec.

1794. She was brought to Boston in 1761, was purchased by Mrs. Wheatley, and, exhibiting a fondness for books, was instructed by her mistress and her daughters, and acquired for the time a superior education, reading Latin with facility. At an early age she began to express her thoughts in verse, and some of her poems written at 14 give evidence of poetic ability. At 19 she visited England, where she attracted much attention. A volume of her poems dedicated to the countess of Huntington was published there, containing her portrait, and bearing the title, 'Poems on various Subjects, Religious and Moral, by Phillis Wheatley, Negro Servant to Mr. John Wheatley of Boston, in New England.' After her return from England she published several poems, among others an address to Gen. Washington. Her book was reprinted in Boston and passed through several editions. The family of Mr. Wheatley being broken up by death soon after her return, she married a negro named Peters, and her last days were spent in extreme want.

Wheatley, Richard, American Methodist clergyman: b. near York, England, 14 July 1831. He received an academic education, was ordained in the ministry and since his removal to the United States has been engaged extensively in literary work. His writings include: 'Cathedrals and Abbeys in Great Britain'; 'Biographic Encyclopedia of the New England States in the XIXth Century' (5 vols.); 'History of the World from the Middle Ages'; etc.

Wheaton, hwé'ton, Frank, American military officer: b. Providence, R. I., 8 May 1833; d. Washington, D. C., 18 June 1903. He was educated at Brown University, went to California in 1862, and studied law at Poitiers, France; lieutenant in the United States cavalry, subsequently participated in various Indian campaigns, and at the outbreak of the Civil War was promoted captain. He served with the Army of the Potomac through the war, was promoted brigadier-general of volunteers in 1862, commanded a division at Gettysburg and in the Shenandoah, and was engaged in other famous movements. He was made colonel in 1874, brigadier-general in 1892, and major-general in 1897. He was retired in the year last named.

Wheaton, Henry, American jurist: b. Providence, R. I., 27 Nov. 1785; d. Dorchester, Mass., 11 March 1848. He was graduated from Rhode Island College (now Brown University) in 1802, and studied law at Poitiers, France; he then took up the practice of law in Providence, and later (1812) moved to New York, where he was editor of the 'National Advocate,' until his increasing law practice caused him to give up that position in 1815. He was for a time one of the justices of the marine court in New York; and in 1816 became reporter for the United States Supreme Court; his reports, which were published in 12 volumes, are exceptionally complete and valuable. In 1821 he was a delegate to the New York State Constitutional Convention; and in 1825 was one of a commission for revising the statute law of New York. In 1827 he was appointed *chargé d'affaires* to Denmark, being the first regular diplomatic agent from the United States to that country, and resided at Copenhagen until 1835, when he was appointed minister resident to the court of Prussia. Two years later he was made minister

WHEATON—WHEEL AND AXLE

plenipotentiary by President Van Buren, which office he retained until 1846. His diplomatic work was most successful; in 1844 he negotiated a treaty with Germany, which, though rejected by the United States Senate, served as a basis for subsequent treaties. In 1843 he was elected a corresponding member of the French Institute, and in the following year a foreign member of the Royal Academy of Science of Berlin. He returned to the United States in 1847. His most important work is his 'Elements of International Law,' published in 1836, which has always been regarded as a standard authority on the subject; numerous editions have appeared in the United States, including one by Lawrence (1835), and one by Dana (1866); there is also an English edition and a French translation. His other writings include 'Digest of the Law of Maritime Captures or Prizes' (1815); 'Life of William Pinkney' (1826); 'History of the Northmen' (1831); 'Histoire du Droit du Gens en Europe, depuis la Paix de Westphalie jusqu'au Congrès de Vienne' (1841), translated into English in 1846; and 'An Inquiry into the British Claim of a Right of Search of American Vessels' (1842).

Wheaton, Lloyd, American military officer: b. Fairfield, Mich., 15 July 1838. He entered the Union army at the outbreak of the Civil War with rank as sergeant and served through the war, receiving promotion to captain of volunteers in 1862, major in 1863, and lieutenant-colonel in 1864. In 1866 he was appointed captain in the regular army, was subsequently employed on frontier duty, and on the outbreak of the Spanish-American war in 1898 he was appointed brigadier-general of volunteers, was assigned to duty in the Philippines in 1899, and in 1900 received rank as major-general of volunteers. He was engaged in all the important engagements in the Philippines, and in 1900-2 was in command of the departments of North Luzon and the Northern Philippines. He was promoted brigadier- and major-general in the regular army in 1901 and in 1908 was retired.

Wheaton, Ill., city, county-seat of Du Page County; on the Chicago & Northwestern Railroad; 25 miles west of Chicago. It is in an agricultural and stock-raising region. It has industrial establishments connected with farm and dairy products, and ships annually considerable hay, vegetables, wheat, flour, live-stock, and dairy products. The water-works plant cost originally \$60,000. The city has eight churches, Wheaton College (Congregationalist), a high school, opened in 1874, public and parish schools, a public library presented by J. Q. Adams, and a college library. Pop. (1890) 1,622; (1900) 2,345; (1910) 3,423.

Wheaton College, located at Wheaton, Ill., 25 miles from the centre of Chicago. It had its beginnings in Illinois Institute, founded by the Wesleyan Methodists in 1856. In 1860 the Institute was sold to a board of trustees affiliated with the Congregationalists, and was chartered under the name of Wheaton College. The organization includes in addition to the regular collegiate department, an Academy, a Business Department, a Conservatory of Music, and an Art Department. Women are admitted to all courses. There are four collegiate courses offered, the classical, the literary, the Latin sci-

tific, and the English scientific; the degree of A.B. is conferred for the completion of any of these courses; before 1903, the three degrees of A.B., B.L. and B.S. were conferred. Certain studies are required of all students; and each course has in addition other required studies, the rest of the work is elective, the scientific courses having the least elective work. The academy offers four corresponding courses, and a teachers' course. The Business Department offers a business course, a shorthand course, and a course combining the two. An arrangement has been made with the American Sunday School Union of the Northwestern district by which a three years' scholarship is given to a young man who will spend six months each year in college, and six months in the missionary work of the Union. The college has a campus of 13 acres on a slight elevation in the city; the buildings are the main buildings, the Woman's Building, and the gymnasium. The library in 1910 contained 6,000 volumes; the Adams Memorial Library, a short distance from the College, is also open to students. The students in 1910 numbered 271, of whom 61 were in the collegiate department, 76 in the Conservatory of Music, and 112 in the Academy.

Wheatstone, hwet'stón, Sir Charles, English physicist: b. Gloucester February 1802; d. Paris 19 Oct. 1875. He commenced business for himself in London as a maker of musical instruments, and in 1823 attracted the attention of scientists by the publication in 'Thomson's Annals of Philosophy' of a paper entitled 'New Experiments on Sound.' In 1834 he was appointed professor of experimental philosophy in King's College, London, and in 1836 exhibited at King's College experiments showing the velocity of electricity. For this purpose he used a circuit of four miles of copper wire. These experiments suggested to him the idea of applying his apparatus to telegraphing. In 1837 with W. F. Cooke, he took out the first patent for magnetic telegraph, but no practical application of this was made till after the Morse telegraph had been operated. Another subject that engaged much of his attention was vision, on which he published various papers, among them a memoir contributed to the 'Philosophical Transactions' in 1848, 'On some Remarkable and Hitherto Unobserved Phenomena of Binocular Vision.' He was knighted in 1868; was a fellow of the Royal Society from the year 1836, and was also a corresponding member of the French Institute and honorary member of the principal academies of science in Europe. He wrote no considerable work, but was the author of numerous papers chiefly contributed to the 'Philosophical Magazine' and the 'Journal of the Royal Institution.'

Wheatstone's Bridge, in electricity, a well known form of the electrical bridge or balance for testing electrical resistance.

Wheel, The, in the southwestern United States, an agricultural league or guild, similar to the Granger movement. The first Wheel was founded in Prairie County, Ark., in 1880, and for some years the order increased rapidly.

Wheel and Axle, one of the mechanical powers, which consists of a wheel round the circumference of which a string may be wound, having a small weight attached to its free end,

WHEEL — WHEEL-GEARING

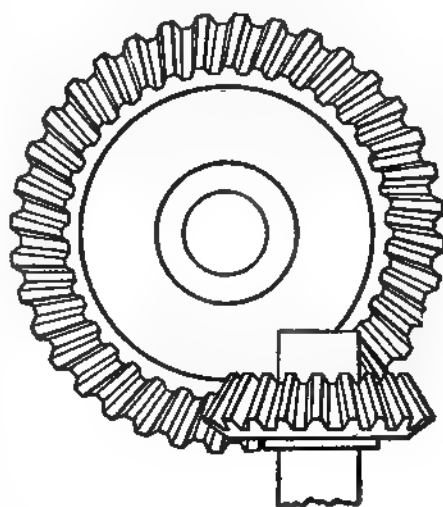
and an axle whose circumference, being smaller than that of the wheel, will sustain a heavier weight at the end of a string which is wound upon it in the opposite direction to that of the string on the wheel. The wheel and axle is merely a case of the lever; the small weight in ounces or other measure of weight multiplied by the radius of the wheel is equal to the balancing weight on the axle multiplied by the radius of the axle. The wheel is grooved, and carries a coil of rope; another rope is secured to the axis; and when the power is in motion every revolution of the wheel raises the weight to a height equal to the circumference of the axis or cylinder. The power is increased by enlarging the wheel or diminishing the diameter of the cylinder; but there is a limit beyond which the increase cannot be obtained with safety. The common winch, the windlass, the capstan, and the tread-mill are so many applications of the wheel and axle; and the same principle may be adapted to a train of wheel-work wherein motion is regulated and power acquired.

Wheel, Breaking on the, a horrible mode of punishment formerly in use in Europe. The condemned criminal was first fastened to two pieces of wood, in the form of a Saint Andrew's cross, with his legs and arms extended, and had the bones of his shins and thighs, and of the fore and upper arms, broken by blows with a bar of iron. After that he was attached to a small carriage wheel balanced on a stake, and allowed to suffer in this position till he died, sometimes several days after the breaking of his limbs. Later the punishment was so far mitigated that the criminal was put to death by a final blow on the breast, spine, or neck, before being exposed on the wheel, and sometimes he was strangled before even the breaking of his limbs took place. This punishment was abolished in France at the Revolution, and is now disused everywhere.

Wheel-bug, any of several species of cone-nose (q.v.).

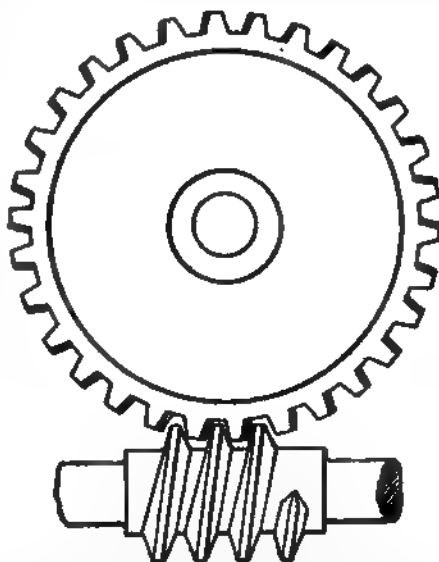
Wheel-Gearing, a general term applicable to all forms of mechanical devices by which motion is transmitted by means of toothed or cog wheels. The different parts of a machine may transmit motion to each other by "direct contact," or by means of an "intermediate connector," in the latter case the motion of the connecting part being usually of no importance since the desired object is simply the proper

nism consists of a series of such elementary combinations, the motion being transmitted to each piece from the one immediately preceding it,

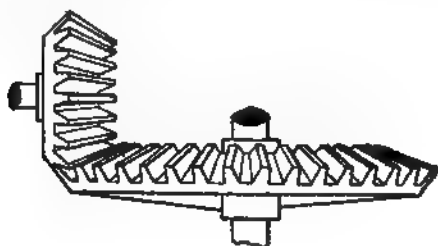


Skew Gearing.

and so on throughout the entire series; therefore, in order to ascertain the action of a complete machine, the "velocity ratio," and the "directional relation," of each combination of the series has to be determined. These factors depend upon the mechanical connection of the two parts, forming the combination, and are



Screw or Worm Gearing.



Bevel Gearing.

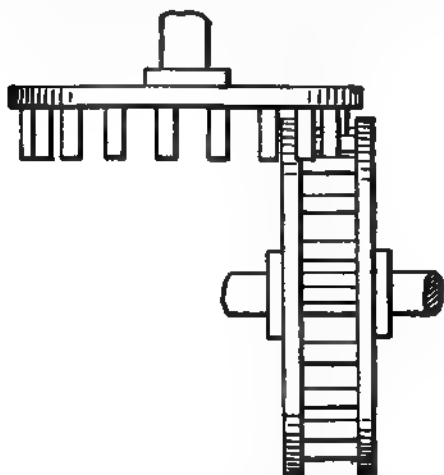
relative motion of the two parts thus connected. In elementary combinations of either kind, the part receiving the motion from the source of power is termed the "driver," and the part to which that motion is transmitted by the driver is termed the "follower." A train of mecha-

absolutely independent of the true velocities or directions of the parts themselves, which may or may not be liable to continual variation. For example, in two circular wheels, in contact with each other, and rotating upon fixed axles, the velocity ratio is constant. If the diameter of one is twice that of the other, the angular velocity of the larger will be one half that of the

WHEEL-GEARING

smaller, but during any changes of velocity whatsoever since the length of the respective radii of the wheels remains unchanged, the velocity ratio at any instant is the same. As to the directional relation: if the wheels are in internal contact, they will rotate in the same direction, and if in external contact, in opposite directions; but in both cases the directional relations will remain unchanged regardless of any change of the absolute direction of the driver. On the other hand, if the wheels are elliptical,

while the larger is commonly known as the "wheel," When the teeth are formed on the inner side of the wheel, or convergent to its centre, it is called an "annular" or internal wheel. Wheels in external contact rotate in opposite directions, but wheels in internal contact rotate in the same direction. As the diameter of the pitch circle of a "wheel" is increased, its curvature decreases and finally becomes a straight line, and results in a "rack and pinion" combination.



Face Gearing.

while the directional relation will remain constant, the velocity ratio will be subject to variation according to varying lengths of the contact radii. All elementary combinations may be divided into four classes—rolling contact, sliding contact, link work, and wrapping connections. The first two are direct methods, while the two last named communicate the motion through intermediate connectors.

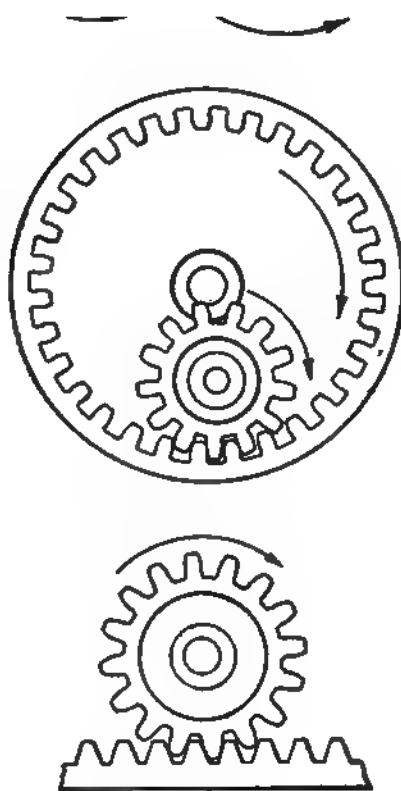
The theoretical forms required to transmit motion by rolling contact are cylinders, cones, and hyperboloids of revolution. In the various forms of "friction gearing," employed to drive light machinery, the rolling pieces are made of different materials, one of wood and the other of iron, or one of them is covered with leather or rubber, and the necessary amount of adhesive contact is secured by adjusting the bearings of the pieces, or by the application of weights or springs. It is, however, impossible to transmit motion against any considerable amount of resistance by means of smooth surfaces, and various methods are resorted to, in order to secure the necessary resistance to slipping. Of these, the one most extensively used consists in the employment of teeth constructed upon the contact surface of the rotating pieces, and known under the general term of "gearing," which may be conveniently divided into five classes, according to the form of the pitch or contact surfaces of the equivalent toothed wheels, and designated as "spur" gears, "bevel" gears, "skew" gears, "screw" or "worm" gears, and "face" gears.

In spur gearing the wheels act upon each other in the same plane; the pitch surfaces are cylinders, and the teeth engage along straight lines parallel to the sides of the cylinders. The smaller wheel is usually termed the "pinion,"

a

b

c



Spur Gearing.

- (a) External Contact.
- (b) Internal Contact (annular).
- (c) Rack and Pinion.

In bevel gearing the wheels act upon each other at an angle; the pitch surfaces are cones, and the teeth engage along straight lines which pass through the common vertex of the two cones. When the angle of contact is equal to 45° they are called "mitre gears." In skew gearing the axles are neither parallel nor intersecting, the pitch surfaces are hyperboloids of revolution, and the teeth engage in lines approximating to the general direction of the common

WHEEL WINDOW—WHEELER

element of the hyperboloid. Owing to the difficulty of constructing the teeth, this class of gearing is not much used, and where the conditions require their application, two pairs of cone wheels are generally employed.

In screw gearing the axes of the cylinders are neither parallel nor intersecting, and the pitch surfaces are in contact only at one point. In its practical form it is known as "endless screw" or "worm gear," and is commonly employed to convert rapid into slow motion. The mounting of the screw prevents any other motion except that of rotation, so that at each complete turn of the screw, a tooth of the engaging wheel passes across the line of centres, and there being no limit to this action, the wheel continues to rotate so long as the screw is turned around its axis.

In face gearing, the teeth consist of pins arranged in a circle, and fastened to a flat circular plate attached to an axis. The wheels act at right angles to each other, and the points of contact are situated only upon the surfaces of the pins. Prior to the introduction of bevel gears, it was the method usually employed to transmit motion between axes that were not parallel, but at the present time it is almost exclusively used in connection with wooden mill machinery.

There are a great many other forms of gearing which are adapted for various purposes. Of them the stepped, twisted, spiral, and differential gearing are the most important. The particular advantage of the last named over ordinary spur gearing being the almost entire absence of friction and the consequent wear of the teeth. Bevel gears of this type have been used with great advantage in mowing machines. By the substitution of epicycloidal and hypocycloidal curves and involutes for the circular arcs in the forms of the teeth, the rolling contact action of the circles, in its relation to the production of a constant velocity ratio, is replaced exactly by a sliding contact action. The teeth of all gear wheels are designed upon the principles of these curves, so that when running together their action is smooth and free from vibration and shock.

Bibliography.—For specific information relative to the application and design of gearing, consult Rankine, 'Machinery and Millwork'; Grant, 'Teeth of Gears'; Kent, 'Mechanical Engineer's Pocket Book' (1903); and Stahl and Woods, 'Elementary Mechanism' (1903).

W. MONSEY, JR.,
Consulting Civil Engineer.

Wheel Window, in architecture, a circular window with radiating mullions resembling the spokes of a wheel.

Wheeler, hwé'ler, Andrew Carpenter, American journalist and author: b. New York, July 1835; d. Monsey, Rockland County, N. Y., 10 March 1903. He began newspaper work on the New York Times, and later became city editor of the Milwaukee (Wis.) Sentinel. Soon after the outbreak of the Civil War, he went with the Federal army as correspondent for several eastern and western papers; and afterward, following two years of incidental writing for the Chicago press, joined the New York Leader staff, then numbering many prominent names. For a time he wrote for the Leader dramatic critiques over the signature "Trin-

cuio." Then he became dramatic and musical critic of the World, and began writing the articles signed "Nym Crinkle." Later still he was on the staff of the Sun. As "Nym Crinkle" he published 'The Chronicles of Milwaukee' (1861); 'The Toltec Cup'; 'The Primrose Path of Dalliance'; 'The Iron Trail,' and other books. Latterly, having withdrawn from journalistic work, he published under the new pseudonym "J. P. Mowbray" (or J. P. M.), two series of essays and two books of fiction—'A Journey to Nature' (1901); 'The Making of a Country Home' (1902); 'Tangled Up in Beulah' (1902), and 'The Conquering of Kate' (1903). His authorship of these later works was not known until after his death.

Wheeler, Benjamin Ide, American college president: b. Randolph, Mass., 15 July 1854. He was graduated from Brown University in 1875, and afterward studied for four years in Germany, traveling also in Greece. He was subsequently engaged as an instructor at Brown, Harvard, and Cornell, and in 1886 was appointed professor of philology at the last named university, receiving the chair of Greek in 1888. In 1896 he accepted the directorship of the American School of Classical Studies, at Athens, Greece, and since 1899 has been president of the University of California. He was editor of the department of philology in Johnson's 'Universal Cyclopaedia' and in Macmillan's 'Dictionary of Philosophy and Psychology,' and has written: 'The Greek-Noun Accent' (1885); 'Analogy and the Scope of its Influence in Language' (1887); 'Introduction to the History of Language,' joint author (1890); 'Organization of Higher Education in the United States' (1896); 'Life of Alexander the Great' (1900); etc.

Wheeler, Joseph, American soldier and statesman: b. Augusta, Ga., 10 Sept. 1836; d. Brooklyn, N. Y., 25 Jan. 1906. He was graduated from the United States Military Academy in 1859; served in several scouting expeditions against Indians in Kansas and New Mexico; in February, 1861, resigned his commission, and in April following was made a first lieutenant of artillery in the army of the Confederate States. In September he became colonel of the 19th Alabama infantry. He commanded a brigade at Shiloh (6-7 April 1862), distinguished himself by his services, and was selected to command the rear-guard when, at the end of the second day's fighting, the Confederates retired from the field. By reason of his success as commander of the rear guard when the Confederates withdrew from before Halleck's army (30 May 1862), and his equally successful command of the salient outpost at Corinth, led to his appointment as head of the cavalry of Bragg's army. As such he led the advance in every forward movement of the forces and commanded the rear guard with the exception of Hood's Nashville campaign (winter of 1864). In August and September 1862 he led Bragg's advance into Kentucky, and detained Buell until Bragg had captured Mumfordsville, with cannon, munitions and supplies. At Perryville (see PERRYVILLE, BATTLE OF, and THE KENTUCKY CAMPAIGN OF 1862), 8 Oct. 1862, Wheeler commanded the cavalry, and displayed great energy and skill. He led a brilliant charge and captured a battery. Ordered to cover the retreat of Bragg's

BENJAMIN IDE WHEELER.

army, he made possible that general's successful escape, with large supply trains, to Cumberland Gap. Rosecrans on 23 December moved forward to attack Bragg before Murfreesboro. Wheeler skillfully retarded Rosecrans' advance, and during the battle (31 Dec 1862 to 3 Jan. 1863) (see STONEMAN, or MURFREESBORO) was, in the words of Bragg's official report, "pre-eminently distinguished." He was commissioned major-general in January 1863, and in June and July took a prominent part in the battles attending Bragg's retreat to Chattanooga. At Chickamauga (19-20 September) he defeated the right flank of Rosecrans' army (20 September), penetrated to the rear, and defeated Watkins in a severe combat. On 20 September he crossed the Tennessee and captured substantially all of Rosecrans' ordnance and supply trains. He fought in the Knoxville campaign in November, and on the 27th, with Cleburne, defeated Hooker at Ringgold Gap. During the spring of 1864 he aided in opposing Sherman's advance from Dalton to Atlanta, commanding the cavalry of the Confederate right wing, under Johnston and Hood. He fought almost daily, his force frequently being dismounted. On 28-31 July he defeated a Federal raiding force under Gen. Stoneman, Garrard and McCook, capturing many prisoners and all the transportation and artillery. On 10 Aug. 1864 he was again in the rear of Sherman's army, capturing supplies, burning bridges and destroying railways. He went as far as the Kentucky line in eastern Tennessee, and then proceeded to northern Alabama. It was impossible, however, to arrest Sherman's advance or destroy his communications. Wheeler was then sent in advance of Sherman's army, keeping the Confederate government and commanders advised of the enemy's movements and preventing foraging parties from leaving the main force. He thus restricted the spoliation of Georgia to a comparatively narrow area. He defeated Macon, Augusta and Savannah, and defeated Kilpatrick at Aiken and Johnsonville. During the operations in North Carolina in 1865, he distinguished himself at Bentonville (19-21 March) by opening an avenue for Johnston's retreat. He was promoted lieutenant-general on 28 February, and commanded Johnston's cavalry until the surrender of the Confederate armies. Subsequent to the war he studied law, and followed that profession and the occupation of a planter until 1880, when he was elected a Democratic representative in the 47th Congress. He was unelected by W. M. Lowe in 1882, but on Lowe's death not long after was re-elected, and in 1884 was returned to the 49th. He was continually re-elected, and was serving at the outbreak of the Spanish-American war. In April 1898 he volunteered for duty, and on 4 May 1898 was commissioned major-general of United States volunteers. On 14 May he was assigned to command the cavalry division, U. S. A., about to leave for the invasion of Cuba. He planned, and commanded in, the battle of Las Guasimas, 24 June 1898, and participated in the battle of San Juan, 1-2 July 1898. He commanded the cavalry division of the Fifth corps in Cuba from 22 June to the surrender at Santiago, 17 July. Subsequently he was in command of the troops at Montauk Point, L. I., and from 7 October to 3 December was in command of the Fourth Army corps at Huntsville, Ala.

From August 1899 to January 1900 he commanded the 1st brigade, 2d division, Eighth corps, in Luzon, Philippine Islands. On 16 June 1900 he was commissioned brigadier-general, U. S. A., and in June-September commanded the Department of the Lakes. On 16 September he retired from the service. His publications include: 'Account of the Kentucky Campaign' (1862); 'History of the Santiago Campaign' (1898); a 'History of Cuba' (1899), and 8 volumes of Congressional speeches (1883-98).

Wheeler, Nathaniel, American inventor: b. Watertown, Conn., 7 Sept. 1820; d. Bridgeport, Conn., 31 Dec. 1893. He was engaged with his father in the manufacture of carriages, but about 1848 joined Allan B. Wilson in manufacturing sewing machines. In 1852, on the establishment of the Wheeler and Wilson Manufacturing Company, he became its president, and by his practical knowledge of machinery and ability as an organizer soon built up what was then the largest sewing machine factory in the world. Subsequently he served for six sessions in the Connecticut legislature; and invented and patented various improvements in sewing machines, railway cars, heating and ventilating apparatus, and wood finishing processes.

Wheeler, William Adolphus, American lexicographer: b. Leicester, Mass., 14 Nov. 1833; d. Roxbury, Mass., 28 Oct. 1874. He was graduated from Bowdoin in 1853, was engaged in teaching for several years, and subsequently assisted Joseph E. Worcester (q.v.) in the preparation of his 'Dictionary' (1856-9). He was afterward occupied with the revised edition of Webster's 'Dictionary' (1864) for which he compiled 'Explanatory and Pronouncing Vocabulary of the Names of Noted Fictitious Persons and Places, including Familiar Pseudonyms, Surnames, etc.,' which was issued separately in 1865. In 1867 he was appointed assistant superintendent of the Boston Public Library. He left unfinished an encyclopedia of Shakespearean literature and an index to anonymous literature entitled 'Who Wrote It?' The latter, completed by C. G. Wheeler, was published in 1881. He edited Hole's 'Brief Biographical Dictionary' (1866); a 'Dickens Dictionary' (1873); and also 'Familiar Allusions' (1882).

Wheeler, William Almon, American legislator: b. Malone, N. Y., 30 June 1819; d. there 4 June 1887. He was educated at the University of Vermont, and was admitted to the bar in 1845. He was United States district-attorney of Franklin county in 1847-9 and in 1849 was elected as a Whig to the State assembly, but in 1856 he joined the ranks of the then newly organized Republican party. He was a member of the New York assembly in 1858-9, in 1860 was elected to Congress; in 1867 was president of the State constitutional convention; was re-elected to Congress 1869 and served until 1877, taking a prominent part in the adjustment of Southern affairs under the Reconstruction act and settling the political difficulties in Louisiana by the well known "Wheeler Compromise." He was vice-president of the United States under Hayes in 1877-81.

Wheeling, hwe'ling, W. Va., city, county-seat of Ohio county; on the east bank of the Ohio River, in the northern pan-handle and in the same latitude as Philadelphia. It is on the

WHEELLOCK

Baltimore & Ohio Railroad, and its branch lines, including the Ohio River and Cleveland L. & W. railroads recently acquired; the Pittsburg W. & Ky. and Cleveland & P. Railroad of the Pennsylvania system; the Wheeling & L. E. Railroad of the Wabash system; the Ohio River & Western Railroad and the Wheeling Terminal Railway, a belt line connecting all the roads. It is the largest and most important city in West Virginia. The land area is 2,050 acres and it has an elevation of 660 feet above sea-level. Part of the city, a beautiful residential section, is on Wheeling Island, which is over a mile long and contains 400 acres. A historic suspension bridge over 1,000 feet long and a modern steel bridge connect the island (the Seventh Ward) with the main part of the city, and two other steel bridges span the west channel of the river from the island to the Ohio side. Eighty miles of trolley lines in Wheeling and suburbs, place a population of 75,000 in West Virginia, Eastern Ohio and Western Pennsylvania in connection with the city as a commercial centre. It has steamer connections with the Ohio and Kanawha River points and commands a large river trade. Among the features of interest are the Court House and City Hall combined (formerly the State Capitol), the new Government building, the site of old Fort Henry, the only sky-scraper in the state, the Henry Clay monument, Wheeling and Mozart parks.

Business Interests.—The excellent transportation facilities of the city, the large supply of natural gas piped from West Virginia and Pennsylvania fields, the extensive coal fields of the vicinity and the abundance of raw material nearby have served to make Wheeling an important manufacturing city. In 1906 Wheeling had 196 manufacturing establishments, capitalized for \$18,227,622, in which were employed 7,215 persons receiving annual wages of \$3,842,659. The yearly cost of raw material used was \$13,806,723 and the finished products were valued at \$23,297,475. The chief manufactures are iron and steel products, pottery, glass, tobacco products, leather, lumber products, canned goods, beer, wagons and carriages.

Churches, Schools, Charities, Etc.—Wheeling has 42 churches, embracing 13 denominations. It is the seat of the Roman Catholic diocese of Wheeling. Besides a modern public school system, including a high school, opened in 1897, there are the Linsly Institute, Mount de Chantal Academy (R. C.), Saint Joseph's Academy (R. C.), two business colleges, several parish schools, and a public library with 18,000 volumes. Bethany College and the West Liberty State Normal School are located a few miles to the north. The city has the North Wheeling and City hospitals, two private hospitals, several orphanages, a day nursery, and homes for the aged and friendless. There are four clubs occupying their own buildings, three theatres, five daily newspapers, a flourishing Y. M. C. A., which will soon erect a new building, an active Board of Trade, and numerous secret and fraternal organizations.

Banks and Finances.—There are 15 banks, including two trust companies and two National banks. The combined capital in 1906 was \$2,387,000 and the deposits \$17,000,000. The clearings for the year ending 31 Dec. 1905 were

\$41,335,368. The volume of banking business has doubled since 1899. The chief items of expense are for schools, \$130,115.65; gas works and electric light plant, \$125,811.89; water-works, \$97,467.20; fire department, \$58,786.20; police department, \$39,817.38; paying and street maintenance, \$59,901.08; health, \$13,866.50; salaries and miscellaneous, \$44,403.23; interest, \$21,113.39.

Government.—The Mayor, elected for two years, the Council, Chief of Police, City Clerk, Wharfmaster and Board of Education are chosen by popular vote. The Board of Public Works, Water and Gas Boards, Chief of Fire Department, Health Officer, City Collector and minor officials are chosen by the council.

History.—Wheeling was one of the first towns founded on the Ohio River and is supposed to have derived its name from the Wheeling or meandering character of Wheeling Creek. The first settlement was made 1769 by Ebenezer Zane. In 1774 a stockade fort—Fort Henry, named in honor of Patrick Henry—was built here as a defense against the Indians. On 1 Sept. 1777 this fort was attacked by an Indian force of 300, who were repulsed, but 15 of the settlers were killed. In 1781 another attack was made. On 11 Sept. 1782 the fort was again besieged by a force of 40 British soldiers and 260 Indians, who continued the attack for two days, but were forced to abandon the fight. In 1793 the town was laid out by Colonel Zane, and in 1806 was incorporated. In 1836 it was chartered as a city and became widely known as an important trading post on the great National road and the Ohio River. In 1861 Wheeling was made the capital of the "restored government of Virginia" by the people of Virginia opposed to secession. It was the state capital from 1863 to 1870, and again from 1875 to 1885. Pop. (1900) 38,078; (U. S. Census 1910) 41,641.

R. B. NAVLOS,

Secretary Board of Trade.

Wheelock, hwel'ok, Eleazar, American clergyman: b. Windham, Conn., 22 April 1711; d. Hanover, N. H., 24 April 1779. He was graduated at Yale in 1733, and from 1735 to 1770 was pastor of the 2d Congregational society in Lebanon, near Columbia, Conn. In 1754 he opened a missionary school for Indians, known from Joshua Moor, who gave for its use a building and two acres of ground, as Moor's Indian Charity School. This he removed in August 1770 to Dresden (now Hanover), N. H., founding Dartmouth College, to which a charter had been granted in 1769.

Wheelock, John, American educator: b. Lebanon, Conn., 28 Jan. 1754; d. Hanover, N. H., 4 April 1817. He was son of Eleazar Wheelock (q.v.). He entered Yale in 1767, but became a member of the new Dartmouth College at Hanover, N. H., and was graduated with the first class in 1771. In 1775 he was elected a member of the provincial assembly, in 1777 was appointed a major in the New York forces, and soon after lieutenant-colonel in the Continental army. In 1778 he led an expedition against the Indians. In 1779 he was elected president of Dartmouth College and remained there, except two years, till 1817. He bequeathed half his large estate to Princeton Theological

WHEELWORK—WHWELL

Seminary. He published 'Essay on the Beauties and Excellencies of Painting, Music, and Poetry' (1774) 'Sketches of the History of Dartmouth College' (1816); etc.

Wheelwork. See **Clockwork**.

Wheelwright, hwē'rit, John, American Puritan clergyman: b. Lincolnshire, England, about 1592; d. Salisbury, N. H., 15 Nov. 1679. He was a graduate of Cambridge, and vicar of Bilsby, near Alford, Lincolnshire; but in 1636, being driven from his church by Archbishop Laud, he emigrated to Boston, Mass., where the same year he was chosen pastor of a branch of the Boston church at Mount Wollaston, in what is now Quincy. The celebrated Anne Hutchinson (q.v.) was his sister-in-law, and he partook of her views. Differences of opinion led to personal animosities between him and John Wilson, the pastor of the Boston church; and the general court appointed a fast in January 1637, partly to heal these dissensions. On this occasion Wheelwright preached in Boston, and as his enemies asserted, denounced the ministers and magistrates. The general court pronounced him guilty of sedition and contempt, for which in November 1637 he was banished from the colony. In 1638 he formed a settlement on the banks of the Piscataqua, which he called Exeter. After a residence of five years here, the town was declared to be within the limits of Massachusetts, and he removed with a part of his church to Wells in the district of Maine. In 1644 his sentence of banishment was revoked, in consequence of some acknowledgments on his part, and he returned to that colony in 1646, and settled in Hampton. In 1654 he published his 'Vindication.' About 1657 he went to England, where Cromwell, who had been his college classmate, received him cordially; but he returned in 1660, and in 1662 settled as pastor in Salisbury, N. H. His 'Writings,' edited, with a memoir, by C. H. Bell, were published by the Prince Society in 1876.

Wheelwright, John Tyler, American author: b. Roxbury, Mass., 26 Feb. 1846. He was graduated at Harvard College in 1876, studied law and was admitted to the Suffolk bar in 1879. He was acting park commissioner of Boston in 1897. He has published 'Rollo's Journey to Cambridge' (1880, with F. J. Stimson); 'A Child of the Century' (1887); 'A Bad Penny' (1895); etc.

Whelan, hwē'lan, Richard Vincent, American Roman Catholic prelate: b. Baltimore, Md., 28 Jan. 1809; d. there 7 July 1874. He was educated at Mount Saint Mary's College, Emmitsburg, Md., and at the Seminary of Saint Sulpice, Paris, where he was graduated in 1831. He was ordained to the priesthood in 1832, returned to the United States, and in 1832-5 was a professor at Mount Saint Mary's. He was engaged in missionary work at Harper's Ferry and other towns in Virginia and Maryland in 1835-40, and in the latter year was consecrated bishop of Richmond. He built a theological seminary near Richmond, founded schools and academies, built a cathedral at Wheeling, and in various ways greatly improved the condition of his diocese. When the diocese was divided in 1850 he became bishop of Wheeling. The Wheeling diocese then contained but two churches and two priests, with no supplementary institutions of any kind. At his death it

possessed 48 churches, 40 stations for religious services, 29 priests, six academies, four convents, a hospital, an orphan asylum, and a college. He was present at the Vatican Council of 1869-70 and opposed the definition of the dogma of papal infallibility, considering the time inopportune for its definition, but upon its declaration he submitted promptly to the decision of the council.

Whelk, a gastropod mollusk of the genus *Buccinum* and order *Ctenobranchiata*. The large or common whelk (*B. undatum*) is of common occurrence on both sides of the North Atlantic, and is distinguished by the shell having its canal notched, and the mouth or aperture of large size. The whorls of the shell, which has a thick horny epidermis, are few and rounded. In England these animals are largely used for food and bait, and are caught in "creels" baited with garbage, but in America they are not eaten. The eggs are contained in egg-cases, bundles of which are common on the sea-coasts; each capsule contains several eggs, some of which develop and devour the others. The red whelk, or "roaring buckie" of the Scotch (*Fusus antiquus*), belongs to the family *Fusida* (q.v.). The tulip whelk (*Fasciolaria tulipa*) is very richly colored and inhabits the tropical seas. The purple whelk (*Purpura lapillus*) is so named from its affording a part of the dye which made Tyre of old so famous.

Wherry, hwē'ri, William Macky, American soldier: b. Saint Louis, Mo., 13 Sept. 1836. He was educated at the University of Missouri and studied law; served through the Civil War; and was present at the battles of Wilson's Creek, Dallas, Kenesaw Mountain, Atlanta, Jonesboro, Nashville, and at the surrender of Gen. J. E. Johnston. He was brevetted brigadier-general of volunteers in 1865, mustered out of the volunteer service in 1866, and appointed captain in the regular army and subsequently served on frontier duty. In the war with Spain in 1898 he took part in the battle of San Juan Hill, and in the capture of Santiago. He was promoted brigadier-general, U. S. A., 7 Jan. 1899, and was retired the same month. He has published 'Battles and Leaders of the Civil War' (1888-9).

Wherry, a light, shallow boat, for plying on rivers; also a light, half-decked fishing vessel, used in different parts of Great Britain and Ireland.

Whetstone, any stone used for sharpening tools. Sandstones and fine mica schists form the coarser kinds. Silicious clay rocks (lutites) and particularly the fine compact rocks made of quartz-mud (siliclutites), such as the Arkansas stone or novaculite, form the more desirable varieties for oil-stones and delicate hones. See **SEDIMENTARY ROCKS**; **SCHISTS**.

Whewell, hwē'el, William, English scholar: b. Lancaster 24 May 1794; d. Cambridge 6 March 1866. He was graduated from Trinity College, Cambridge, in 1816, and in due course became fellow and tutor of his college. He labored with Herschel, Babbage, and Peacock to raise the standard of mathematics in the university, and wrote text-books which were justly celebrated. From 1828 till 1832 he was professor of mineralogy, and in 1838 was elected

to the Knightbridge chair of moral philosophy, which he held till 1855. In 1841 he became master of Trinity and in this position labored earnestly and successfully to obtain for the natural and moral sciences a better recognized position among the studies of the university. He became fellow of the Royal Society in 1820, and was one of the first members of the British Association, of which he was president in 1841. Whewell was a strong, healthy, clear-headed man, possessed of a vigorous and capacious intellect, and endowed with extraordinary powers of acquiring and retaining knowledge. The extent and variety of his attainments were something wonderful. Yet there was nothing superficial about his learning, notwithstanding the well-known *wit* of Sydney Smith, that "science was his forte and omniscience his foible." Besides other gifts, he built at his own expense, and presented to his college, a *hætel*, or collection of chambers for undergraduates. His principal writings include: *The Bridgewater treatise 'Astronomy and General Physics, considered with reference to Natural Theology'* (1833); *'History of the Inductive Sciences'* (1837); *'Philosophy of the Inductive Sciences'* (1840); *'Novum Organum Renovatum'*; *'Indications of the Creator'*; *'History of Scientific Ideas'*; *'Elements of Morality, including Polity'*; *'Lectures on Systematic Morality'*; *'Architectural Notes on German Churches'*; *'On Liberal Education in General'*; *'Lectures on the History of Moral Philosophy in England'*; *'Philosophy of Discovery'*; *'History of Moral Philosophy'*; *'Platonic Dialogues for English Readers.'* He was the author of the well-known anonymous essay, *'The Plurality of Worlds.'* Consult: Toddhunter, *'Whewell an Account of His Writings'* (1876); *'Life'* by Mrs. Stair Douglas (1881); Clark, *'Old Friends at Cambridge and Elsewhere'* (1900).

Whichcote, hwich'köt, Benjamin, English Anglican clergyman: b. Stoke, Shropshire, 11 March 1610; d. Cambridge May 1683. He was educated at Emmanuel College, Cambridge, took orders in the English Church in 1636, held the living of North Cadbury, Somerset in 1641, and the next year was appointed provost of King's College, Cambridge. He was a leader of the latitudinarian school of English divines, a famous preacher, and one of the Cambridge Platonists. His works, published posthumously, include: *'Observations and Apophthegms'* (1688); *'Moral and Religious Aphorisms'* (1703); *'Sermons'* (1698-1707), etc. Consult: Tulloch, *'Rational Theology,'* Vol. II. (1892); Westcott, *'Essays in the History of Religious Thought'* (1891); Mulhunger, *'History of the University of Cambridge'* (1892).

Whigs, a word of British origin, used for many years to designate an American political party. It had previously been used in America in colonial and revolutionary times to indicate those who were opposed to the attempts of the British Crown to deprive the Americans of their political and commercial rights. It disappeared with the close of the Revolution, and did not appear again until the National Republicans, successors to the Federalists (q.v.), adopted the name of Whigs. Those Whigs who considered the slavery question settled by the compromise of 1850 were called in Massachusetts "Cotton

Whigs," and in New York "Silver Grays." The Whigs continued to exist as one of the two great parties until the election of 1852, which was followed by a division on the slavery issue, the anti-slavery Whigs joining the Republican party, and the others making common cause with the Democracy.

The term was prominent in British political history for nearly two centuries to designate the political party which advocates such changes in the constitution as tend in the direction of democracy. Defoe thus accounts for the origin of the name: "The use of it began then when the western men (the peasantry of the West Lowlands of Scotland), called Cameronians, took arms frequently for their religion. Whig is a word used in those parts for a liquor (whig, Scotch for *whisky*), which the men used to drink . . . and so became common to the people who drank it. It afterward became a denomination of the poor harassed people of that part of the country, who, being unmercifully persecuted by the government, against all law and justice, thought they had a civil right to their religious liberties, and therefore resisted the power of the prince (Charles II.)." Monmouth was sent to quell the insurrection, and "at his return he found himself ill-treated for having used the rebels too mercifully; and Lauderdale told Charles, with an oath, that the duke had been so civil to the Whigs because he was a Whig himself to his heart. This made it a court word, and in a little time the friends and followers of the duke began to be called Whigs."

A different origin is, however, assigned to the term. Sir James Balfour, in writing of an outbreak which occurred in 1648, in his own day, calls the enthusiasts "whiggamores," and Burnet, who was then five years old, offers the following explanation: "The southwest counties of Scotland have seldom corn enough to serve them throughout the year, and the northern parts producing more than they need, those in the west come in the summer to buy at Leith the stores that come from the north; and from a word, whiggan, used in driving their horses, all that drove were called the whiggamores, and shorter, the whiggs. After the news come of Duke Hamilton's defeat (in 1648), the ministers animated their people to rise and march to Edinburgh; and they came up, marching at the head of their parishes, with an unheeded fury, preaching and praying as they came. . . . This was called the whiggamores' inroad, and ever after that all that opposed the court came in derision to be called whiggs; and from Scotland the word passed to England." The Whigs brought about the revolution of 1688-9, and established the Protestant succession; they were chiefly instrumental in obtaining the abolition of the slave-trade and slavery, the repeal of the Test and Corporation Acts, Catholic emancipation, parliamentary and municipal reform, the repeal of the corn-laws, and similar measures. The term Liberals is now generally applied to the representatives of this party; the extreme section of the party, who agitate for sweeping innovations, usually have a more or less close connection with the Whigs, and have adopted the name of Radicals. See POLITICAL PARTIES.

Whin. See FUZZ.

Whin, **Whinstone**, a mining term for intruded igneous or basaltic rocks generally of a firm texture and resistant character. The great Whin Sill of Northumberland is a typical example.

Whin-chat, an European warbler (*Protonotus rubetra*), allied to the stonechat, and is named from its frequenting the neighborhood of whin and furze bushes. It possesses a long white streak, passing across the sides of the head, which, as well as all the upper parts of the body, is colored brown. The lower parts are yellowish. Its song is very sweet, and it has been known to imitate the song of other birds.

Whip or **Coach-whip Snake**, a light brown harmless snake (*Zamenis flagelliformis*) with whitish tail, closely related to the blacksnake. It is found in the southern United States and Mexico, and is especially abundant in Texas. Its name is given it on account of its general appearance; and the more ignorant Indians and negroes believe it will whip or lash its adversary with its tail. It runs with the utmost swiftness, and has the general habits of a blacksnake (q.v.). A group of very slender poisonous African and Asiatic tree-snakes, the *Dipsosaurus*, are called whip-snakes in some books. They are elapine and poisonous, and conceal themselves aided by their leaf-green color, in bushes where they dart upon birds, lizards, insects, etc., unsuspecting of their presence.

Whipping Post, a punishment inflicted by the law of England, and also in the State of Delaware, chiefly for minor offences. The criminal law in England enumerates several offences for which the punishment may be inflicted on males under 16. A subsequent act enacts that when the offender is under 14 the number of strokes is not to exceed 12. In Scotland no person above 16 is to be whipped for theft or crime committed against person or property. In Delaware robbery, theft, and other crimes are punished by whipping. See also **FLAGELLATION**.

Whipple, hwip'l, **Abraham**, American naval officer: b. Providence, R. I., 1733; d. near Marietta, Ohio, 29 May 1819. In the French and Indian war he commanded the privateer *Gamecock* and on one cruise alone captured 23 prizes. He was in charge of the expedition which on 8-9 June 1772 destroyed the British armed schooner *Gaspee*, commanded successively the *Columbus*, the schooner *Providence*, and the frigate *Providence*, and from 1775-9 with the schooner *Providence* took more prizes and destroyed more vessels than any other commander in the colonial service. With the frigate *Providence* he evaded British surveillance and succeeded in getting to sea with important despatches for France, and in 1779 performed the daring exploit of capturing 10 vessels from a merchant fleet of nearly 150 sail, eight of which reached Boston safely, and brought \$1,000,000. He commanded the naval forces at Charleston, S. C., in 1780, but was captured and held a prisoner until the close of the war. He commanded the vessel which in 1784 unfurled the first American flag on the river Thames.

Whipple, Edwin Percy, American author and critic: b. Gloucester, Mass., 8 March 1819; d. Boston 16 June 1886. After a secondary education, he began writing for newspapers, in

1837 became a clerk in a Boston brokerage office, and from 1837 to 1860 was superintendent of the reading-room of the Merchants' Exchange. In 1843 he first attracted attention by a critical panegyric on Macaulay in the Boston 'Miscellany,' and in October of that year entered upon his successful career as a lecturer, chiefly on literary topics. He contributed much to reviews and journals, publishing in 1848-9 two volumes of 'Essays and Reviews,' including discussions of 'English Poets of the 19th Century,' 'Byron,' 'Rufus Choate,' and 'Henry Fielding.' In 1872-3 he was literary editor of the Boston *Globe*, a newly-established daily. The greater part of his work is composed of essays on literature and authors, though he treated of other subjects with an almost equal discrimination. His 'Literature of the Age of Elizabeth' (1876) probably shows him to best advantage, though his estimates of the moderns are also painstaking and for the most part just. His characterizations were penetrative, and at times very effectively expressed. He lacked, however, to a large extent, originality and power, and Whittier's declaration that "with the possible exception of Lowell and Matthew Arnold, he was the ablest critical essayist of his time" cannot now be accepted. Among his further publications are: 'Literature and Life' (1849), a small volume of lectures; 'Character and Characteristic Men' (1866); 'Success and its Conditions' (1871). Three books appeared posthumously, 'Recollections of Eminent Men, with Other Papers' (1887), with an introduction by C. A. Bartol; 'American Literature and Other Papers' (1887), with a brief introduction by Whittier, and containing the centennial review of American literature written in 1876 for 'Harper's Magazine'; and 'Outlooks on Society, Literature and Politics' (1888). Consult papers by T. W. Higginson in the 'Atlantic,' Vol. lviii. 345, and by T. W. Hunt in the 'Bibliotheca Sacra,' l. 30.

Whipple, Henry Benjamin, American Protestant Episcopal bishop: b. Adama, Jefferson County, N. Y., 15 Feb. 1822; d. Faribault, Minn., 16 Sept. 1901. Ill health prevented his entering college, for which he had prepared, and he engaged in business for several years. In 1847 he began a theological course privately, took priest's orders in the Episcopal Church in 1850 and was rector of Zion Church, Rome, N. Y., 1850-7 and of the Church of the Holy Communion, Chicago, 1857-9. In October 1859 he was consecrated first bishop of Minnesota. He very soon afterward organized the Seabury Mission at Faribault, out of which have since been developed the cathedral of Our Merciful Saviour, Seabury Divinity School, the Shattuck School for boys, and Saint Mary's Hall, a school for girls. Bishop Whipple was widely known as "the apostle to the Indians" on account of his labors among them both for their material as well as spiritual welfare. By the Indians themselves he was called "Straight Tongue." He thoroughly understood the Indian character and at the time of the Sioux massacre in 1862 insisted that the trouble came directly from the false dealing of the whites with the Indians. In 1876 he secured the Sioux treaty, opening up the best portions of Dakota to white settlement, and his advice in regard to Indian affairs was sought by every President from Lincoln to McKinley. In his 'Lights and Shadows

of a Long Episcopate' (1899) the character of the Indian problem will be found very fully treated. Bishop Whipple traveled extensively and was well known and highly regarded in England, while in his own country he was beloved and respected by men of every creed.

Whipple, Squire, American civil engineer: b. Hardwick, Mass., 24 March 1804; d. Albany, N. Y., 15 March 1888. He was graduated from Union College in 1830 and engaged in canal and railway surveying. He patented in 1840 an iron bridge truss of the bowstring type, several of which were built over the Erie Canal. After 1852 he built several bridges known as the "Whipple trapezoidal type," and in 1872 took out a patent for a lift drawbridge, one of which was built over the Erie Canal at Utica. He wrote: 'The Way to Happiness' (1847); 'Treatise on Bridge Building' (1847); and 'The Doctrine of Central Forces' (1866).

Whipple, William, American soldier and politician: b. Kittery, Me., 14 Jan. 1730; d. Portsmouth 28 Nov. 1785. Before 1751 he was captain of a merchantman trading with the West Indies and making voyages to Africa for slaves. But in 1759 he set up as a merchant at Portsmouth, and in 1775 was chosen a delegate to the New Hampshire provincial congress. He was also made a member of the provincial council of safety. In January 1776 he was elected to the Continental Congress, continuing to hold his seat until September 1779, and signing the Declaration of Independence. As brigadier-general of New Hampshire troops, he commanded a brigade in the operations against Burgoyne in 1777, and assisted in negotiating the terms of the surrender of the British general. Commanding the New Hampshire forces, he co-operated with Sullivan in the campaign against the British in Rhode Island in 1778. From 1782 to 1784 he was superintendent of finance for New Hampshire, and from 1782 until his death a judge of the superior court. He was president of the commission for the adjustment of the dispute between Connecticut and Pennsylvania regarding the Wyoming Valley region.

Whippoorwill, a North American night-jar (*Antrostomus vociferus*). In this genus the rictal bristles are greatly developed and reach far beyond the tip of the small, weak bill, and sometimes they are fringed. The nostrils are not tubular as in *Nyctidromus*. The whippoorwill is 10 inches long with a spread of wings of about 18 inches, the rictal bristles are simple, the tail long and rounded, and the soft lax plumage closely and delicately mottled with gray, black, white, and yellowish brown, the female with the tips of the outer tail-feathers tawny, the same parts in the male white. These birds inhabit the United States and British provinces east of the plains, and breed, chiefly northward, throughout most of this area. Being migratory they reach the Middle and New England States in May. The whippoorwill is a strictly nocturnal bird, but usually becomes quiet by midnight except on moonlight nights when they continue active till dawn, but at all times they are most vociferous during the early evening. The song is a clear, energetic whistle, aptly syllabified in the name, strongly accented on the last syllable, and is repeated many

times; then, after a short pause, begins anew. They fly noiselessly in pursuit of flying insects, skimming low over stone walls and bushes or even alight on the ground to pick up a beetle or other insect. Large moths, night-flying beetles, and insects frequenting forest borders are their chief food. As they pass close to a person at night they are heard to utter a low murmuring sound. Unlike the great majority of birds they always perch along and not across a bough, a peculiarity which they share with other weak-footed birds. Whippoorwills do not fly abroad during cloudy days like the night hawk, and as a consequence their appearance is unknown to many persons to whom the song is quite familiar. No nest is made and the two elliptical creamy white eggs marked with brown and lavender are laid in a depression on the bare ground or a log. When danger threatens, the old birds often carry the eggs or young in their mouths to a place of safety. A much larger species of similar colors and habits, but more southern in its range, is the chuck-will's-widow (*A. carolinensis*) (q. v.). In this species the rictal bristles are provided with lateral filaments.

Whiptail Scorpion. See SCORPION.

Whirligig Beetle. See WATER-BEETLE.

Whirlpool, a circular eddy or current in a stream or the sea, produced by the configuration of the channel, by meeting currents, by winds meeting tides, etc. There are some very celebrated whirlpools, such as Charybdis, in the strait between Sicily and Italy; and the Malström, off the coast of Norway. When agitated by tides or winds they sometimes become dangerous to navigators. These are not, however, whirlpools in the strict sense, which are indeed very rare, but merely superficial commotions created by winds meeting tides, and in calm weather are free from all danger.

Whirlwind. See CYCLONE; SIMOON; WATER-SPOUT.

Whisky, the name applied to a well-known liquor distilled from barley, wheat, oats, and other grains; potatoes, beet, and other roots, and subsequently refined, colored and flavored by various processes. Whisky from malt alone is made in the Scotch distilleries as follows: The malt is bruised upon cylinders, and the quantity intended to be mashed is put into the mash pan, water at a temperature of about 170° F. being then added. After two or three hours' agitation the whole is left to repose for an hour and a half, and then the worts are drawn off to about one third of the water employed. About two thirds of the first quantity of water of a somewhat higher temperature is put into the pan, and the agitation is renewed for about half an hour. After a second period of repose these second worts are drawn off. Both infusions are now cooled down as quickly as possible to the temperature of 80° or 70° to prevent souring; the wort is cooled down by being exposed in shallow coolers to currents of air, or by being passed through serpentine tubes surrounded with cold water. More water may be let into the pan, and a third wort drawn off, which may be fixed with the other worts, or used instead of water for the first infusion of malt. The quantity of saccharine matter con-

by courtesy of the
THE LATE BISHOP HENRY BENJAMIN WHIPPLE,
PROTESTANT EPISCOPAL BISHOP OF MINNESOTA AND APOSTLE TO THE INDIANS.

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WHISKY

verted into alcohol depends upon the proportion of ferment or yeast introduced into the worts; if too little be used, a portion of the sugar will remain undecomposed; if too much, the spirits will have an unpleasant taste. Generally the worts are let down at the specific gravity of 1.050 or 1.060, and at a temperature of 60° to 50°. For every 100 gallons a gallon of good porter yeast is added and thoroughly incorporated by agitation. An hour after the addition of the yeast fermentation begins to show itself by a ring of froth around the edges of the vat, and in about five hours frothy bubbles cover its whole surface. Large vats generally afford a better result than small ones, owing to the equality of the fermenting process. It is considered good worts when the specific gravity comes down to that of water and superior worts when it falls to 0.995. In about 48 to 60 hours the wash begins to get clear and comparatively tranquil, and is then ready for distillation. In its simplest form the still consists of a copper boiler into which the wash is poured. This vessel is furnished with a close head terminating in a bent tube which passes in a spiral form through a vessel filled with cold water. (See DISTILLATION.) On the application of heat to the still the spirit begins to rise in vapor at 175°, along with more or less steam. These vapors are condensed in passing through the spiral tube, and trickle in fluid form into a receiver. The product of this first distillation is called low wines. This is again distilled at a lower temperature, which gets rid of part of the water and of the fetid oils that had come over with the alcohol. Great purity and strength can only be obtained by repeated distillation. The casks or packages into which these spirits are put are never charred, as in America, but preference is given to empty wine or rum casks which impart both flavor and color, and when plain casks are used, flavoring and coloring is accomplished by means of blending wines. If nothing whatever is added to the spirits which are put in plain casks, the coloring and flavoring is attributable to the tannic acid extracted from the wood, and the oxidation of the aldehydes in combination with the ethyl alcohol.

In the United States, Kentucky, Maryland, and Pennsylvania whiskies, or those represented to be such, constitute the majority of those consumed for drinking purposes, either medicinal or otherwise. Kentucky whiskies are known as Sour Mash, Sweet Mash and Bourbons, and Pennsylvania and Maryland whiskies as Eastern Ryes. At the head of the various processes of distillation, for excellence of quality of the spirit produced thereby, stands that known as "fire copper," which is the method that originally established the high reputation of whisky in these States; those since employed, while giving a larger yield of spirit to the bushel of grain, procure it at the expense of the quality and flavor thereof. In this process the corn and rye meals are scalded or mashed with hot spent beer, which is the liquid residue of the previous distillation. The mash is then allowed to cool to the proper temperature, when malt is added, and the mash, diluted with a sufficient quantity of water, is left to ferment the time established by law. The diluted mash when fermented is called beer. The beer is distilled in three different ways. In the very smallest distilleries, it is

sometimes boiled in copper stills, over wood fires; the vapor, passing through a copper coil or worm, immersed in cold water, is condensed and delivered into a receiver. The condensed liquid is called low wines, or singlings. Singlings contain only a small amount of spirit. This manner of boiling the beer is seldom used, as the large quantity of grain contained in the beer makes it apt to cake in the still, and, becoming scorched, it gives the whisky a strong, smoky flavor, a very little of which, however, is not considered objectionable. The singlings are doubled or again distilled in small copper stills, or doublers, over wood fires, and the vapor again condensed in a copper worm, whence it is delivered into the receiving cistern. Another name for doublings is highwines. The usual way of distilling sour mash whisky is to boil the beer in a wooden still by admitting steam, the vapor being condensed into singlings; the singlings are doubled as above. In the third way, the beer is boiled in a copper still, by steam confined in a copper pipe, placed inside of the still. The singlings are doubled in small copper stills, over wood fires, in the same manner described. This latter way is considered a great improvement, as it avoids both the scorching of the grain in distilling the beer and the admission of live steam, while it preserves all the characteristics so highly prized in "sour-mash, fire copper" whiskies. The yield by the sour-mash process is from two to three gallons to the bushel of grain.

Most whisky is made by the process known as "steam." In this the corn and rye meals and malt are mixed with water in the mash-tub, where they are scalded with direct or live steam, introduced by means of a perforated pipe at the bottom of the tub. When fully scalded, the mash is cooled down and run into the fermenting tubs. Fresh yeast is used in fermenting, which gives the name of "sweet mash." The still is made of wood and divided into two or three compartments. When the still is charged, a certain amount of beer is placed in each compartment, live steam is admitted into the lower, which boils the beer, and the vapor from it ascends through a curved pipe into the compartment above, where its continued reception boils the charge therein contained; the vapor from this again ascends into the next compartment above, where the same process is repeated. The vapor then passes through a pipe into a wooden doubler, where it boils the low wines; and the vapor arising thence passes into a copper worm, where it is condensed and then run into the whisky cistern. Only one worm is used and one condensation made. Highwines, as well as whisky, are manufactured by this process. The yield is from three and a half to four and a half gallons. In making whisky by the "steam copper" process, the mash is made and fermented and the beer boiled, in the same manner as for the "steam" process. The same wooden still is used; but, instead of the vapor from the upper compartment passing directly into a wooden doubler, it is run through a worm and condensed into singlings, which are doubled in a copper still by live steam, or by steam confined in a jacket around the still, or sometimes by fire underneath.

In locating a distillery a full supply of clear, bright water, that contains the proper chemical

WHISKY

qualities, is the first consideration. It is well known to both chemists and practical distillers that water containing a large quantity of sulphate of lime, earthy carbonates, and no organic matter, is best adapted to distilling. The lime and carbonates being dissolved in the acid generated during the fermentation of the mash, mostly pass off in the form of carbonic acid gas, and leave the water soft and best suited for extracting the active properties of the malt and grain. Great care has to be taken in the selection of the grain to have it well developed and sound. Musty or unsound grain is fatal to the production of fine whisky, and its defects become more prominent as the whisky increases in age. Those distillers most careful to manufacture only fine goods use the grain that is grown in their own section of the country, in order to have both the grain and water spring from the same kind of soil. Successful fermentation requires of the distiller not only constant attention, but also extensive knowledge both of the principles of chemistry and of practical results. It is exceedingly injurious to allow the fermentation to be prematurely concluded or to proceed too long. As a general rule, the slower the fermentation and lower the heat at which the distillation is carried on, the finer and purer will be the spirit. The mash being made and fermented, and the beer distilled by whatever process, the whisky is collected in the cistern, and thence run into barrels, under the control of the United States inspector, and in the custody of the United States storekeeper, who has also charge of it while in the bonded warehouse, till the tax is paid. Barrels, and the cooperage thereof, require much attention, and must be made of well-seasoned oak. For high-wines they are not charred, but for whisky they should be well charred, as the char has some peculiar chemical effect on the character and ripening of the whisky that is very desirable.

The subsequent purity of the product depends largely upon the care exercised by the distiller in stopping the distillation when the temperature of the vapor rises above the boiling point of ethyl alcohol and water and certain flavoring bodies depending upon the material employed.

The process of fermentation which precedes that of distillation produces a number of alcohols radically different from ethyl alcohol (which, with water, is the body of whiskies) and which seriously serve to contaminate the product. These are usually referred to by the distiller in America as the "heads" and "tails," because the former have a lower boiling point than that of ethyl alcohol, and the latter a higher boiling point, as a result of which a careful distiller can separate them from the main body of the distillate which is to be preserved.

In England these heads and tails are called "feints." Among these is fusel oil, from which it is very desirable that the spirit should be freed as soon as possible. This may be partially accomplished by the action of charcoal and heat, which are the principles underlying the barrel-charring process of refinement and maturation. If, however, the fusel oil contents are too large to start with, they will never be sufficiently reduced by such process to make the product wholesome and palatable. In such case, they can only be removed or reduced by a subsequent process of rectification, including redis-

tilling and the passage of the spirits through leach tubs. It follows, therefore, from the process of manufacture, that the fusel oil contents or percentage of impurities is not fixed or constant, and this fact led to the process called blending. Under the present system of Internal Revenue Laws in the United States distilled spirits can be sold only by one who qualifies thereunder as a wholesale liquor dealer, and such person may also be a rectifier. A rectifier is one who rectifies, purifies, or refines distilled spirits, or who merely mixes without refining. Whenever it is found that whisky which has been subjected to the barrel-charring process still contains an excessive quantity of fusel oil, or has acquired an excessive quantity of tannic acid, it can only be corrected by redistillation or other rectifying processes or by the addition thereto of ethyl alcohol and water (termed for commercial purposes either "neutral spirits" or "cologne spirits") which contains no fusel oil and no tannic acid. One effect of charring a barrel is to produce a coating of a gummy, resinous substance beneath the char and next to the hard wood which is classed as caramel and which not only imparts a flavor, but produces about two thirds of the color usually obtained by spirits which have been stored in such a barrel for a length of time. The other one third of the color is imparted by the tannin or flavescin which the spirits extract from the wood.

Since neutral spirits are seldom put in charred barrels, they retain their original color, which is water white, and when they are mixed with the whisky which has been colored, it necessarily lightens the color which has to be restored by the addition of plain caramel. Harmless flavorings are sometimes added to modify or soften the effect of the tannin, which is a severe astringent. On account of their diminished toxicity, smoothness which sometimes results from the addition of sugar, and improved flavor which results from diluting or diminishing the tannic acid, acetic acid, and fusel oil, blends are considered by some more desirable than a simple whisky.

The bulk of the so-called straight or simple whiskies in America are made by adding water to the high wines or doublings in the receiving cistern until they are reduced to "100 proof" or "proof,"—approximately half ethyl alcohol and half water,—and then storing them in charred barrels.

High wines contain higher alcohols known as "impurities," created during the process of fermentation. If these impurities are removed from the high wines, the spirit is then termed "neutral," but that term is properly applied to it only so long as it is kept in its original condition, free from any coloring or flavoring matters. To insure this result, neutral spirits are stored in paraffined or waxed barrels. Neutral spirits when put into charred barrels are converted into whisky, but milder in flavor and less fiery than whisky produced from high wines. Being unsuitable for blending purposes, such whisky is seldom produced in America, although all foreign whiskies partake more of its characteristics than of whisky produced from high wines.

The recent custom of steam-heating warehouses in which whisky in charred barrels is

WHISKY FRAUDS--WHIST

stored, increases the proof very materially. If kept in damp storage, the proof would diminish. Whisky ranges in proof from 70 to 120, but all spirits that have been subjected to the process usually recognized as producing whisky, are considered whisky without reference to their "proof."

No standard for whisky is created by the Federal laws, but many of the states have adopted the standard laid down in the United States Pharmacopœia, which requires that whisky for medicinal purposes should be approximately from 88 to 110 proof, should contain no more than traces of fusel oil from grain and oak tannin from casks, a stated limit of free acid, and show a residue from 100 C. C. evaporated on a water bath and dried at 212 F. of not more than 0.5 Gm. Blended whiskies more nearly meet these requirements than straight whiskies.

Whisky, whether called "straight" or "blended" is composed of approximately half water and half ethyl alcohol, plus a color and a flavor, and the only substantial difference between the two consists in the percentage of fusel oil and tannic acid, which exist in straight whiskies in a larger amount than in blended whiskies.

According to the report of the Commissioner of Internal Revenue for the fiscal year ended 30 June 1910, grain to the amount of 29,327,437 bushels was consumed in the manufacture of whisky, the product of which for that year in the United States amounted to 156,237,526 gallons.

Whisky Frauds. The, in American civil history, a national internal revenue scandal, which reached its climax in 1874 through the efforts of Secretary of the Treasury D. H. Bristow. Statistics showed that for some years prior to 1874 the United States had, in St. Louis alone, lost at least \$1,000,000 of revenue which it should have received from whisky, yet special agents of the Treasury set to work from time to time had failed to do more than cause an occasional flurry among the thieves. The Whisky Ring was organized in St. Louis when the Liberal Republicans there achieved their first success. It occurred to certain politicians to have the revenue officers raise a campaign fund among the distillers. This idea the officers modified later, raising money in the same way for themselves, and in return conniving at the grossest thievery. As it became necessary to hide the frauds, newspapers and higher officials were hushed, till the ring assumed national dimensions. Its headquarters were at St. Louis, but it had branches at Milwaukee, Chicago, Peoria, Cincinnati, and New Orleans, and an agent at Washington. A huge corruption fund was distributed among gaugers, storekeepers, collectors, and other officials, according to a fixed schedule of prices. As a result of the investigation by Secretary Bristow arrests were made in nearly every leading city. Indictments were found against 152 liquor men and other private parties, and against 86 government officials, notably the chief clerk in the Treasury Department, and Gen. Grant's private secretary, Gen. O. E. Babcock.

Whisky Insurrection, a popular name given to a local outbreak in opposition to the

excise laws passed by Congress 3 March 1791. General objections were urged against the measure and in western Pennsylvania the inhabitants considered the tax an unfair discrimination against their particular region and raised an insurrection. It became necessary for President Washington to call out an army of 15,000 militia to subdue the rebels, who dispersed without bloodshed.

Whispering Gallery, a gallery or dome of an elliptical or circular form, in which faint sounds conveyed around the interior wall may be readily heard, while the same are inaudible elsewhere in the interior. Thus, in an elliptical chamber, if a person standing in one of the foci speak in a whisper, he will be heard distinctly by a person standing in the other focus, though the same sound would not be audible at the same distance under any other circumstances, or at any other place in the chamber. There is a whispering gallery in the Capitol at Washington, one at Saint Paul's Cathedral, London, and another at Gloucester Cathedral, England.

Whist, a well-known game at cards, first clearly described by Edmond Hoyle (q. v.) in his 'Short Treatise on the Game of Whist' (1743). The game is played with the full pack of 52 cards by four persons, two being partners against the other two, each player receiving 13 cards dealt out one by one in rotation. The last card dealt is turned face up, and is called the trump card; it gives a special power to the suit to which it belongs. The cards rank as follows: ace (highest), king, queen, knave, and the others according to their number of pips. Play is commenced by the person on the left hand of the dealer laying down a card face up on the table, the other players following in succession with cards of the same suit if they have them. When all have played the player who has the highest card takes the four cards laid down, which constitute a trick. The winner of the trick then leads, as the first of a new trick, the winner of which becomes the leader, and so on. When a player cannot play a card of the same suit, he may play one of the trump suit, and take the trick, or lay one of a different suit, which gives him no chance of winning the trick. When the hand is played out the score is taken as follows: the partners who conjointly gain the majority of tricks score one point for every trick taken above six. The ace, king, queen, and knave of the trump suit are called honors, and count one each for the side which holds them; if one side hold three honors, they count two by honors, as the opposite side can have but one; if one side hold all the honors, four by honors is counted; should the honors be equally divided neither side counts, the honors being then said to cancel each other. In long whist, an obsolescent form of the game, 10 of these points made a game. In short whist, the game now generally played, the number has been reduced to five, and in this form it is common to count by tricks alone. A rubber consists of a series of three games, and is won by the side that secures two of them. Should one party gain two games in succession, the third of the rubber is not played. In duplicate whist the hands played are preserved and replayed by the opposing side.

Whistle-wood, a North American maple-tree (*Acer pennsylvanicum*). It is a small tree, or sometimes only a shrub, common in the mountainous districts of the eastern United States and Canada. Generally it is found in thicket-like young woods, growing in damp rocky soil. The flowers are in long axillary racemes, and bloom late in spring, drooping under the branches. They are succeeded by strings of the two-celled winged fruit of a yellowish green tint. They dangle there all summer. The slender trunks are olive-green, when older becoming a reddish-brown in color, striped with short, delicate streaks of white pigment, which may be scraped off, and for this reason the tree is often called striped maple; it is, however, also known as moose-wood, since the deer are fond of the young shoots when the sugary sap is flowing. The bark is easily stripped off the young branches, leaving white withes from which country folk make whistles. Other whistles are made from the bass-wood (*Tilia americana*), and the name is given in Great Britain to the mountain-ash (*Pyrus*) and to the common and sycamore-maples.

Whistler, hwhs'lér, James Abbott McNeill, American artist: b. Lowell, Mass., 10 July 1834; d. London 17 July 1903. In 1851 he was appointed to the West Point Military Academy, which he left in 1854; and in 1854-5 was a draughtsman in the Coast and Geodetic Survey. This employment he soon quitted, going to England and thence to Paris, where in 1855-7 he was a pupil in the studio of C. G. Gleyre, an artist of Ingres' school who "never drew a line without having first assured himself how Raphael would have proceeded." Previous to the series generally styled the "French Set," Whistler is known to have etched three plates, and other early attempts were almost certainly made. The "French Set," renderings of figures, street scenes, and interiors, appeared in 1858 (published by Delâtre)—12 plates, with an etched title. But a few copies were printed. In 1863 Whistler went to London and settled in Chelsea. During his earlier days there he completed the 'Thames Set' of etchings, 16 in all, treating of the craft of that stream and the quaint buildings along its edge. Some rare prints of these, generally considered superior, were made before their publication in 1871. 'The Pool' and 'Black Lion Wharf' are among the best of them. He exhibited his paintings quite frequently at the Royal Academy, one of the earliest being 'At the Piano,' purchased by the Scottish painter John Phillip for 30 guineas. In 1872 the 'Arrangement in Gray and Black' ('The Painter's Mother'), now in the Luxembourg Gallery, was accepted by the Academy only on the insistence of Sir William Boxall. Whistler sent other pictures, such as 'The Last of Old Westminster,' and 'Symphony in White III,' but he could not agree with the management of that institution, long before his death ceased to exhibit there, and was never made A.R.A. Some of his best work was shown at the Grosvenor Gallery, opened by Sir Coutts Lindsay in 1877, including famous portraits, 'Irving as Philip II' and the 'Arrangements,' 'Harmonies,' and 'Nocturnes,' novel in title and character. It was in 1877 that Ruskin wrote of the 'Nocturne, Black and Gold' ('The Falling Rocket'), then at the Grosvenor: "I have seen and heard much of cockney impudence be-

fore now, but never expected to hear a concomb ask 200 guineas for flinging a pot of paint in the public's face" ('Fors Clavigera'). Then ensued the diverting Ruskin suit, brought for libel by the artist and heard in November 1878. The verdict was for the plaintiff, and the farthing assessed for damages Whistler afterward wore on his watch chain. The costs against Ruskin, £306 12s. 4d., were met by a public subscription. Whistler followed up the affair by his pamphlet, 'Art vs. Art-Critics,' in which he first proved his cleverness in controversial satire. He preferred to exhibit his works under conditions which he could himself direct, and gave a special exhibition in 1874. Others, of either prints or paintings, were held in the rooms of the Fine Arts Society in 1880, 1881, 1883, 1884, and 1886. At the International Society, Knightsbridge, he always had chief place. He became a member of the Royal Society of British Artists in 1884, and in 1886 some "revolutionary members" made him its president. His administration improved the artistic quality of the exhibitions, but was not commercially successful; and in 1889 he failed of re-election and many of his following resigned. His explanation was characteristic: "It is all very simple. The Royal Society of British Artists has disintegrated—the 'artists' have come out, the 'British' remain." He failed for a long time of the recognition he merited, but latterly many distinctions were conferred upon him. He was a member of the Legion of Honor and the Bavarian Order of Saint Michael, member of the Munich, Rome, Dresden, and other academies, in 1900 received the unusual award at the Paris exposition of the gold medal for etching and also for painting, and in 1902 the gold medal of honor from the Pennsylvania Academy of Fine Arts. By many Whistler's etchings have been ranked as the consummate product of his art, classed with those of Rembrandt, and even said to surpass the world's greatest etcher in the process of selecting essentials and a certain subtlety in execution. He did not keep a set of proofs or memoranda of his work, and it is as yet impossible to make a complete list of his etchings. The first catalogue of them appeared in 1874. Wedmore gave 214 in 1886, 268 in 1889; a supplement to Wedmore increased the number to 372. It is probable that with the search certain to be made the list will be brought up to more than 400 prints. It has been said, and probably with much justice, that while Rembrandt chose greater subjects, only a comparatively small part of the total number of his plates is sought by collectors, but all of Whistler's are highly esteemed by connoisseurs. "There are no failures," declares one writer; some are sketchier than others, but all are genuine expressions of Whistler's art. Whistler used an increasing economy of means; the 'First Venice Set,' published by the Fine Arts Society in 1880 (12 plates), and the 'Twenty-six Etchings' (1886), principally of Venetian subjects, though including some English also, show in this respect great difference from the 'French' and 'Thames' sets. The unflinching characteristics of the etchings are precision and flexibility of line, and remarkable picturesqueness in the rendering of shade and light. Their observation and their technical skill are alike noteworthy. Of the single plates may be men-

tioned 'Joe,' 'Little Putney,' 'Battersea Bridge,' 'Old Chelsea,' and 'Speke Hall.' Examples are to be seen in many important public collections, including the Venice Academy, Bibliothèque Nationale, British Museum, the New York Public Library, and the Dresden Gallery. In dry-point and lithography, too, Whistler was very successful. His first lithographs he made in 1877, and he greatly perfected the art. His London exhibition of 1883 contained, besides etchings, a number of dry-points; in 1896 about 70 lithographs were shown at the Fine Arts Society. The Way catalogue, no longer in print, and claiming to include all those printed down to 1897, gave 130, to which at least eight must further be added. The list of nearly 400 etchings and dry-points and 138 lithographs, known to be in existence, reveals a large amount of work, even supposing that the artist had done nothing else. In pastel and water-colors Whistler wrought sparingly, although some of the Venetian pastels are the equals of anything yet attempted in that medium. His creed as a painter he stated in two series of 'Propositions,' and the lecture 'Ten O'Clock' first given in London 20 Feb. 1885. One of the propositions was that a painting had "no mission to fulfil," but was a "joy to the artist, a delusion to the philanthropist, a puzzle to the botanist . . ." Critics he thought a herd of ignoramuses; but they had their utility — "they keep one always busy, always up to the mark, either fighting or proving them idiots." For a long time in London he was better known for his pugnacity than for his art. His arrogance, his mordant wit, his sparkling bon-mots, his striking individuality — these were sooner recognized than his genius. He had in oils a broad range of subjects. There are the numerous portraits; marines ('Valparaiso Harbor'; 'Blue Wave — Biarritz'; 'The Ocean'); and landscapes of many sorts, especially those interpretative of night. His method was to apply many coats of thin color instead of one or a few of greater consistency; this guarantees to his work a superior permanence. He was above all the colorist, and in pure line and color harmonies has been called one of the supreme artists. His work has repeatedly been compared to that of Velasquez, but study shows very important dissimilarities, and Whistler must remain unique. He borrowed somewhat from Oriental art, though always subordinating these elements to his own ends. Among portraits not referred to is that of Carlyle, now in the Glasgow Museum, of which the philosopher observed, "Weel, man, you have given me a clean collar, and that is more than Meester Watts has done", and Sarasate (Pittsburg Academy). Whistler did also some work in interior decoration, such as the music-room of Sarasate (Paris) and the "Peacock-room" for Mr. Leyland (London). Many fine examples of his paintings are in American galleries, public and private. His place in the history of art cannot yet be estimated, but he may safely be put among the greatest painters of the 19th century. No 'Life' has as yet (1904) appeared, and recourse must be had to his own writings, to the extensive periodical literature concerning him, and to the discursive but interesting 'Recollections and Impressions' by Eddy (1903) and Menpes' 'Whistler as I Knew Him' (1904).

Whistlewing, or Whistler, a duck. See **GOLDEN-EYE.**

Whiston, hwis'ton, William, English mathematician and Anglican clergyman: b. Norton, Leicestershire, 9 Dec. 1667; d. London 22 Aug. 1753. He took his degree at Clare Hall, Cambridge, in 1690, and in 1691 was elected to a fellowship there. He was ordained a deacon in 1693, was appointed chaplain to the Bishop of Norwich, and in 1698 became vicar of Lowestoft, Suffolk. He was appointed deputy professor of mathematics to Newton at Cambridge in 1701, and in 1703, upon Newton's resignation, succeeded to the Lucasian professorship. He continued to preach, but having given expression to Arian views, was in 1710 summarily expelled from his professorship and the university. He removed to London where he published 'An Historical Preface to Primitive Christianity Revived' (1711). He was thereupon prosecuted for heresy, but after proceedings lasting five years, was permitted to remain in the English Church. He subsequently engaged in lecturing upon scientific subjects, being among the first to introduce lectures with experiments in London. He founded in 1715 a society for the promotion of Primitive Christianity, the meetings of which were held in his home, and afterward became a Baptist. He made a translation of Josephus (1737) which ran through many editions and wrote: 'New Theory of the Earth' (1696); 'The Accomplishment of Scripture Prophecies' (1708); 'A New Method of Discovering the Longitude' (1714); 'The True Origin of the Sabellian and Athanasian Doctrines of the Trinity' (1720); 'The Testimony of Philegon Vindicated' (1732); 'The Longitudes Found by the Ellipsis of Jupiter's Planets' (1738); 'Memoirs' (1749); etc.

Whitaker, hwit'a-ker, Alexander, American clergyman: b. Cambridge, England, 1585; d. Henrico County, Va., after 1613. He was graduated from Cambridge, was for some years rector of a north of England parish, settled in Henrico County, Va., in 1611, and was active in missionary work. He baptized Pocahontas, and officiated at her wedding. He wrote 'Good News from Virginia,' one of the first books written in the colonies (1613).

Whitaker, John, English Anglican divine: b. Manchester about 1735; d. Ruan-Longhorne, Cornwall, 30 Oct. 1808. He was educated at Oxford. In 1771 he published a 'History of Manchester,' and in refutation of Macpherson's theory that the modern highlanders were descendants of the Caledonians of Tacitus, wrote his 'Genuine History of the Britons' (1772), maintaining that they were descended from an Irish colonization which followed the Roman invasion. In 1778 he was presented by his college to the rectory of Ruan-Longhorne. His most important works are: 'Sermons upon Death, Judgment, Heaven, and Hell' (1783); 'Mary, Queen of Scots, Vindicated' (1787); 'The Origin of Arianism Disclosed' (1791); 'The Course of Hannibal over the Alps Ascertained' (1794); 'Life of Saint Neot' (1809).

Whitaker, Joseph, English publisher: b. London 4 May 1820; d. Enfield, Middlesex, 15 May 1895. In 1849 he started a church monthly called 'The Penny Post,' soon after established a theological publishing business of his own in

Fall Mall, and in 1856-59 was editor of 'The Gentleman's Magazine.' He founded 'The Bookseller' in 1858, but his name is remembered principally in the title of 'Whitaker's Almanac,' which first appeared in 1868. The 'Reference Catalogue of Current Literature' was started by him in 1874.

Whitaker, Nathaniel, American Presbyterian clergyman: b. Long Island, N. Y., 20 Feb. 1732; d. Woodbridge, Va., 21 Jan. 1795. He was graduated from Princeton in 1752, entered the ministry and became pastor of a church at Chelsea, Conn., and visited England in 1765-6, accompanied by Samson Occom, an educated Indian, for the purpose of soliciting funds for the establishment of an institution of learning in America for the use of the Indians. His mission resulted in the foundation of Dartmouth College. He was subsequently engaged in pastoral duties in Massachusetts and in Maine, finally removing to Virginia. He was a staunch Whig and ardently supported the cause of the Colonies during the Revolution. Several of his sermons were published.

Whitaker, Osi William, American Protestant Episcopal bishop: b. New Salem, Mass., 10 May 1830. He was graduated from Middlebury College, Vt., in 1856 and from the General Theological Seminary in 1863. He took priest's orders in the last named year, was rector of Saint John's, Gold Hill, Nev., 1863-5, of Saint Paul's, Englewood, N. J., 1865-7, and of Saint Paul's, Virginia City, Nev., 1867-9. In 1869 he was consecrated missionary bishop of Nevada, was translated to the diocese of Pennsylvania as assistant bishop in 1886, and upon the death of Bishop Stevens in 1887 became bishop of Pennsylvania. Died 9 Feb. 1911.

Whitbread, hwt'bréd, Samuel, English politician: b. Cardington, Bedfordshire, 1758; d. 6 July 1815. He was educated at Oxford and Cambridge and entered the House of Commons in 1790 as Whig member for Bedford. He at once made his mark in Parliament as an able advocate of parliamentary reform, religious and civil liberty, the abolition of slavery, and similar liberal causes, and as a strong opponent of Pitt's war policy. He took a leading part in the impeachment of Viscount Melville in 1805-6, and against Lord Chatham for his mismanagement of the Walcheren expedition in 1809. Consult 'The Creevy Papers' (1903).

Whitby, hwt'bi, Canada, capital of Ontario county, a town and port of entry on Lake Ontario, at the southern terminus of the Whitby and Port Perry Railway, and on the Grand Trunk Railway, 30 miles east of Toronto. It has iron foundries, tanneries, manufactures of agricultural implements, mill machinery, and musical instruments, and carries on an active agricultural trade.

Whitby, England, seaport in the North Riding of Yorkshire, 48 miles north-northeast of York, at the mouth of the Esk, which divides it into two parts. The houses are ranged on bold acclivities, and an ancient restored cruciform church stands on the verge of a lofty cliff; there are several modern churches and Nonconformist chapels; a town hall, court house, museum, temperance hall, seamen's hospital, etc. The harbor is spacious and commodious, having wet and dry docks, etc. The manufacture

of jet ornaments is carried on, this substance being abundant in the neighborhood. There are also yards for ship and boat building, and productive sea fisheries. In 657 Saint Hilda founded her famous priory on the site of Whitby, then called Streoneshalh, and in it was held the important Synod of Whitby in 664, at which the Roman usage as regarded Easter was adopted (see EASTER). The poet Cadmon (q.v.) was a resident in this monastery, of which nothing now remains, though the choir, north transept, and part of the nave of an abbey erected on the site in the 11th century are still standing. These ruins are in early English style, and extremely beautiful. The neighborhood is rich in picturesque scenery and interesting features. Pop. about 13,000. Consult: Kitchin, 'Whitby Abbey and Other Essays' (1904).

Whitcher, hwich'er, Frances Miriam Berry, American humorist: b. Whites town, N. Y., 1 Nov. 1811; d. there 4 Jan. 1852. She was married in 1847 to Rev. B. W. Whitcher, an Episcopal clergyman of Elmira, N. Y. Her 'Widow Bedott's Table-Talk' first appeared in 'Neal's Saturday Gazette,' published by J. C. Neal, author of 'Charcoal Sketches.' After her death these and other humorous articles of the journalistic type, once very popular, were collected in 'The Widow Bedott Papers' (1855), and 'Widow Sprigg, Mary Elmer, and Other Sketches' (1867).

White, Andrew Dickson, American diplomat, educator and author: b. Homer, N. Y., 7 Nov. 1832. He was graduated from Yale in 1853, and studied at the College of France, Paris, and at the University of Berlin. He was attaché of the American legation at Saint Petersburg in 1854-5 at the time of the Crimean War, and in 1857, shortly after his return to the United States, became professor of history and English literature at the University of Michigan. In 1863 he returned to Syracuse and was elected to the New York State senate, where he was especially interested in educational legislation, obtaining the passage of bills organizing the State normal system, and providing for the codifying of the educational laws. He also had an important part in the founding and organization of Cornell University, and in procuring for that institution the national land grant for agricultural colleges; in 1867 he became president of the university, and was also professor of history. He maintained his connection with Cornell until 1885, when he resigned both presidency and professorship. He gave to the university his excellent historical library of about 30,000 volumes, and on the acceptance of this gift the departments of history and economics were reorganized as the White School of History and Political Science. While president of Cornell, he was also active in public affairs; in 1871 was one of a commission to study and report on the desirability of annexing Santo Domingo; in 1878 was honorary commissioner to the Paris exposition, and in 1879-81 minister to Germany, during which time he had leave of absence from the university. In 1892-4 he was minister to Russia; in 1896 was one of the commissioners to investigate the Venezuela boundary question; and in 1897-1902 was ambassador to Germany, holding that position longer than any other American minister. Before his

WHITE

retirement from the German ambassadorship he was elected a member of the Berlin Academy of Sciences. In 1899 he was president of the United States delegation to the Hague Peace Conference. He has written 'History of the Warfare of Science against Theology' (1898), an enlargement of his 'Warfare of Science' (1876); 'Studies in General History'; 'The New Germany'; 'European Schools of History'; 'Paper Money Inflation in France' (1876); 'Chapters from My Diplomatic Life' (Century Mag., 1903); 'Autobiography' (1905).

White, Arnold, English author. He has published 'The Modern Jew' (1899); 'Problems of a Great City'; 'English Democracy'; 'Efficiency and Empire'.

White, Arthur Silva, English publicist: b. London 1 Feb. 1859. He was secretary to the Royal Scottish Geographical Society and editor of the 'Scottish Geographical Magazine' in 1884-92, and for 15 years was engaged in foreign travel. In 1898 he explored the oasis of Siwa, and in 1900 traveled in the Sudan. His publications include: 'Development of Africa' (1890); Report to the Paris Geographical International Congress (1898); 'From Sphinx to Oracle' (1899); 'The Expansion of Egypt' (1899); etc.

White, Charles Abiathar, American geologist: b. North Dighton, Mass., 26 Jan. 1826. He was State geologist of Iowa in 1866-70, occupied the chair of natural history at the Iowa State University in 1867-73, and in 1873-5 held that chair at Bowdoin College, Maine. In 1874-98 he was engaged as geologist and paleontologist on different United States government surveys, and since 1876 has been connected honorarily with the Smithsonian Institution and the United States National Museum, where he is now associate in paleontology. He has published 'Report on the Geological Survey of Iowa' (1870); 'Report on Invertebrate Fossils and Surveys West of the 100th Meridian' (1875); 'Review of the Fossil Osteidae of North America' (1881); 'The Relation of Biology to Geological Investigation' (1894); etc. A complete list of his writings, including 211 titles (1860-85) was catalogued by J. B. Marcott (1885).

White, Edward Douglass, American jurist: b. parish of Lafourche, La., 3 Nov. 1845. He was educated at Mount Saint Mary's College, Md., and at the Jesuit College in New Orleans and during the Civil War served in the Confederate army. He subsequently studied law and was admitted to the Louisiana bar. He was State Senator in 1874; associate justice of the Supreme Court in Louisiana in 1878; and United States Senator in 1899-04. While still a member of the Senate he was appointed an associate justice of the United States Supreme Court.

White, Edwin, American naval officer: b. Ohio 1843; d. Brooklyn, N. Y., 23 Dec. 1903. He was graduated from the United States Naval Academy in 1864; was promoted lieutenant-commander in 1869, commander in 1886, was on duty at the Naval Academy as commander of cadets in 1895-98, received rank as captain in 1898 and was assigned to command the 'Philadelphia,' flagship at the Pacific station. He returned from Samoa in 1899 with broken health

and was retired from active duty with rank of rear-admiral.

White, Eliza Orne, American author: b. Keene, N. H., 2 Aug. 1836. Her publications include: 'Miss Brooks' (1890); 'Winter-borough' (1892); 'When Molly Was Six' (1894); 'The Coming of Theodora' (1895); 'A Little Girl of Long Ago' (1896); 'A Browning Courtship and Other Stories' (1897); 'A Lover of Truth' (1898); 'Edna and Her Brothers' (1900); 'John Forsyth's Aunts' (1901).

White, Frank, American politician: b. Stillman Valley, Ill., 12 Dec. 1856. He was graduated in civil engineering from the University of Illinois in 1880. A few years later he moved to North Dakota, where he became active in politics as a Republican; in 1891-3 he was a member of the lower house of State legislature, and in 1893-9 a member of the senate. During the Spanish-American war he joined the army, was major of the 1st North Dakota regiment and served in the Philippines. In 1901 he was elected governor of the State for a term of four years.

White, Sir George Stuart, English soldier: b. 6 July 1835. He was educated at Sandhurst, entered the army in 1853, served in the Indian mutiny and the Afghan war, became military secretary to the viceroy of India, and in 1881 lieutenant-colonel of the Gordon Highlanders. His subsequent promotions were colonel (1885), lieutenant-general (1895), major-general, and field marshal. From 1893 to 1898 he was commander-in-chief of the forces in India, in 1898-99 quartermaster-general to the forces, and in 1899-1900 was general on staff to command troops at Ladysmith. He defended Ladysmith 118 days (2 Nov. 1899-18 Feb. 1900) against the Boers, being relieved by Lord Dundonald after a disastrous siege. In 1900 he was made governor of Gibraltar. See SOUTH AFRICAN WAR.

White, Gilbert, English naturalist: b. Selborne, Hampshire, 18 July 1720; d. there 26 June 1793. He was graduated from Oriel College, Oxford, in 1743, and having taken deacon's orders in 1747, acted as curate to an uncle at Swarraton. After being ordained priest he was for a short period in 1751 curate to the vicar of Selborne. Appointed dean of his college in 1752 he soon after became curate of Durlay, Hampshire. He failed to secure the provostship of Oriel in 1757, but in the same year obtained the vicarage of Morton Pinkney, in Northamptonshire, which was in the gift of his college. He never resided on his Northamptonshire living, but throughout his whole life remained closely associated with the Hampshire parish which he has made famous. About 1758 he gave up the Durlay curacy for that of Faringdon, near to his home, though for a time he acted as curate of West Deane, Wiltshire. White's great English classic 'The Natural History and Antiquities of Selborne,' the only work of the kind in the language to attain that rank, was published at the end of 1783, with the date 1789 on the title page. It consists of letters to his two friends, Thomas Pennant, author of the 'British Zoology,' and James Barrington, who devised the form of 'Naturalist's Journal' which White kept from 1767, when he

discontinued the 'Garden Kalendar' begun in 1751. In the preparation of the part on antiquities, compiled only when he had been induced to publish, he was greatly assisted by Richard Chandler, the classical antiquary and traveler. His 'Natural History of Selborne' has won the enthusiastic admiration of men of widely different tastes, and has gone through a very large number of editions. Professor Newton says that such was White's keenness of observation, his undoubted errors are scarce worthy of notice. In America, where most of the plants and animals mentioned are, save to a few experts, known only by name, the popularity of the work has been great. The most important editions after the first are the following: the so-called Markwick's or Aikin's (1802), including 'The Naturalist's Calendar,' which Dr. Aikin had compiled from White's papers and published in 1795, but excluding the 'Antiquities'; the 1813 octavo, including his poems for the first time; Mitford's (1813); Rennie's (1833); Bennett's (1837), based upon the preceding; Jardine and Jesse's (1851); Jardine's (1853); Harting's (1875), one of the best, based upon Bennett's; Buckland's (1875), with a chapter on the 'Antiquities' by the Earl of Selborne; Bell's (1877), which superseded all previous ones, and may still be regarded as the best (see BELL, THOMAS); Grant Allen's (1899), without the 'Antiquities'; and Bowdler Sharpe's (1900-1901), including the 'Antiquities' and the 'Garden Kalendar.' There is a bibliography (1897) by E. A. Martin. Consult further: Jesse, 'Gleanings in Natural History' 2d series (1834); Gordon, 'Gilbert White in Sussex' (1893); and the considerable amount of magazine literature.

White, Greenough, American educator and Episcopal clergyman: b. Cambridge, Mass., 26 July 1863, d. Sewanee, Tenn., 3 July 1901. He was graduated from Harvard in 1884, was professor of English language and literature at the University of the South, Sewanee, Tenn., in 1885-7, occupied that chair at Kenyon College in 1888-9, and in 1893 became a deacon in the Episcopal Church. He served as minister at Saint James' Church, West Hartford, Conn., in 1893-4, at the same time occupying the chair of history and political economy at Trinity College, Hartford. In 1894 he returned to his position at the University of the South, which he occupied until his death. He was ordained to the priesthood in 1896, and in 1897 became acting professor of the history of art at the university. He wrote: 'Sketch of the Philosophy of American Literature' (1890); 'A Saint of the Southern Church' (1897); 'An Apostle of the Western Church' (1899); 'Outline of the Philosophy of English Literature'; 'The Rise of Papal Supremacy'; etc.

White, Henry Kirke, English poet: b. Nottingham 21 March 1785; d. Cambridge 19 Oct. 1866. The son of a butcher, he was apprenticed to a stocking weaver, and later to an attorney, in whose office he devoted his spare time to the study of Latin and Greek. At 14 he wrote verse which was published in different magazines, and in 1803 published 'Clifton Grove, a Sketch in Verse, with Other Poems,' a venture which won for him the attention and friendship of Southey and other literary men.

He obtained a starship at Saint John's College, Cambridge, in 1804, and entered upon his studies with such close application that his health broke under the strain, resulting in his death from consumption. After his death his manuscripts were placed in charge of Southey, who edited his poems, letters, etc., and published them under the title 'Remains, etc., with an Account of his Life' (1807). He will be longest remembered by his hymn beginning

"When marshalled on the nightly plain
The glittering host bated the sky."

White, Harvey, American author: b. New London, Iowa, 26 Nov. 1866. He was graduated from Harvard in 1894 and was reference librarian in the John Crerar library 1896-99. He has published 'Differences' (1899); 'Quicksand' (1900); 'When Eve was not Created, and Other Stories' (1900); 'Noll and the Fairies' (1902).

White, Horace, American journalist and editor: b. Colebrook, N. H., 10 Aug. 1834. He was graduated from Beloit College in 1853, removed to Chicago, and there became city editor of the *Evening Journal* in 1854. He was later connected with the *Chicago Tribune*, and accompanied Lincoln during his campaign against Stephen A. Douglas in 1858, his narrative of the famous debates being given in Herndon's life of Lincoln. He was editor of the *Chicago Tribune* in 1865-74 and in 1887 removed to New York, where he became associated with Carl Schurz and E. L. Godkin in editing the *Evening Post*. He was editor-in-chief of that publication from 1899 to 1903, when he retired, though still remaining connected with the paper. Among his publications are: 'The Silver Question'; 'Money and Banking Illustrated by American History' (1895, 2d ed. 1902); 'The Gold Standard'; etc. He edited Luigi Corra's 'Scienza delle Finanze' (1889); and translated Appian's 'Roman History' (1899).

White, Hugh Lawson, American jurist and legislator: b. Iredell County, N. C., 30 Oct. 1773; d. Knoxville, Tenn., 10 April 1840. He served as a volunteer against the Cherokees in 1792, studied law and began practice at Knoxville in 1796. He was judge of the supreme court of Tennessee, 1801-7 and 1809-15, became United States district attorney in 1807, in 1809 was elected to the State senate, was president of the Bank of Tennessee in 1815-27, State senator in 1817-25, United States commissioner in 1821-4 for the adjustment of claims against Spain, and in 1825 was elected to the United States Senate to succeed General Jackson. He was opposed to the making of internal improvements by the Federal government and led in the movement which resulted in the abolishment of the National Bank. He was an earnest advocate of the removal of the Indians west of the Mississippi, and by his support of the bill to limit executive patronage incurred the enmity of Jackson. In 1835 he was nominated for the presidency and received 25 votes in the electoral college. He became a declared Whig in 1838 and in 1839 resigned his seat in the Senate because of his unwillingness to vote for the Sub-Treasury Bill, as he had been instructed to do by the Tennessee legislature. Consult Nancy N. Scott, 'Memoir of Judge White' (1836).

WHITE

White, John Blake, American artist and author: b. Eutaw Springs, S. C., 2 Sept. 1781; d. Charleston, S. C., 24 Aug. 1859. He studied under Benjamin West in London in 1800-04. Returning to the United States, he established himself in Boston, but on account of the lack of practice went to Charleston, S. C., and became a lawyer, was successful in that profession, and was several times a member of the South Carolina legislature. His best known picture, 'The Unfurling of the United States Flag in the City of Mexico,' was destroyed during the Civil War. His other paintings include: 'Battle of Eutaw Springs' (1804); 'Battle of Fort Moultrie' (1806); 'Battle of New Orleans'; 'Mrs. Motte Presenting the Arrows'; and 'Marion Inviting the British Officer to Dinner' (1836). He also wrote the dramas 'Foscari, or the Venetian Exile' (1805); 'Mysteries of the Castle' (1806); 'Modern Honor' (1812); 'Triumph of Liberty, or Louisiana Preserved' (1819); and 'Intemperance' (1839).

White, John Hazen, American Protestant Episcopal bishop: b. Cincinnati, Ohio, 10 March 1849. He was graduated from Kenyon College in 1872 and Berkeley Divinity School, Middletown, Conn., in 1875. He was ordained priest in 1876, was rector of Grace Church, Old Saybrook, Conn., 1878-81; of Christ Church, Joliet, Ill., 1881-89; St. John's Church, St. Paul, 1889-91, and warden of Seabury Divinity School, Fairbault, Minn., 1891-95. In the last named year he was consecrated bishop of Indiana, and on the division of the diocese in 1899 chose the northern portion with the title of bishop of Michigan City.

White, John Williams, American classical scholar: b. Cincinnati, Ohio, 5 March 1840. He was graduated from the Ohio Wesleyan University in 1868, and studied at Harvard and at Berlin. He occupied the chair of Latin and Greek at Willoughby College in 1868-9, at Baldwin College in 1869-71, continuing there as professor of Greek alone in 1871-4. He was tutor of Greek at Harvard in 1874-7, assistant professor there in 1877-84, and since then has been full professor. His publications include: 'Edipus Tyrannus of Sophocles' (1873); 'First Lessons in Greek' (1876); 'Realia of Greek Literature' (1882); 'The Old Scholia on the Aves of Aristophanes' (1903); etc. He was senior editor of 'The College Series of Greek Authors' (30 vols., 1879).

White, Joseph Blanco, English clergyman and author: b. Seville, Spain, 11 July 1775; d. Liverpool 30 May 1841. After study in Seville University, he was ordained sub-deacon (1796) and priest (1800) in the Roman Catholic Church, in 1802 was appointed to a chaplaincy in the Chapel Royal of Saint Ferdinand at Seville, but, having abandoned his belief in Christianity, withdrew from the priesthood, and went to England in 1810. There he became editor of 'Español,' a monthly periodical, circulated in Spain (partly by the English government) in aid of the national cause; in 1812 again became a Christian; and in 1814 qualified as an English clergyman. He began contributing in 1820 to the 'New Monthly,' edited by Thomas Campbell (q.v.), and in 1825 published 'Evidences against Catholicism.' In 1826 he settled at Oxford as a member of Oriel,

and there Newman, Pusey, and other leaders of the Oxford movement learned much from him respecting Catholic theology. He finally became an acknowledged Unitarian, and from 1835 lived at Liverpool, doing some desultory literary work. Many of his books had a real interest in their time, but he is best known to literature by his sonnet 'Night and Death,' which Coleridge, in a letter of 1827, declared to be the finest in the English language. Among his further publications are 'Letters from Spain by Don Leucadio Doblado' (1822), 'Second Travels of an Irish Gentleman in Search of a Religion' (1833; in answer to Thomas Moore's 'Travels'), and 'Observations on Heresy and Orthodoxy' (1835).

White, Octavius Augustus, American physician: b. Charleston, S. C., 8 Feb. 1826; d. New York 25 May 1903. Graduated from the College of Charleston in 1846, and from the South Carolina Medical College in 1848, he practised with success until the outbreak of the Civil War, when he was made surgeon in the Confederate army. He became an expert on yellow fever, during the war was sent within the Union lines at Goldsborough, N. C., for medical services connected with the fever, and wrote much on the subject, as well as on general topics of medicine and surgery. Several professional inventions are to be credited to him.

White, Percy, English novelist: b. London 1852. He taught English literature and language in a French college for some years, entered journalism in 1880 and for ten years edited 'Public Opinion.' He has published several brilliant novels, strongly satirical in character, among them being: 'Mr. Bailey-Martin' (1893); 'Andria' (1896); 'A Millionaire's Daughter' (1898); 'The Heart of the Dancer' (1900); 'The New Christians' (1902).

White, Peregrine, the first child born in New England of English parents: b. on board the Mayflower, in the harbor of Cape Cod 20 Nov. 1620; d. Marshfield, Mass., 22 July 1704. He was the son of William and Susanna White, and on account of his birth received 200 acres of land from the general court. He filled various civil and military offices, and "was vigorous and of a comely aspect to the last." His father died during the colonists' first winter at Plymouth, and the marriage of his mother to Gov. Edward Winslow was the first wedding in New England.

White, Richard Grant, American author and critic: b. New York 22 May 1821; d. there 8 April 1885. He was graduated from the New York University in 1839, studied medicine and then law, and became a contributor of musical, art, and dramatic critiques to the New York *Courier and Enquirer*. From 1854 to 1859 he was an editor of this journal; and of the *World* 1860-1. His 'Yankee Letters,' contributed in 1863-7 to the London 'Spectator,' were interesting narratives of contemporary events and of considerable service to the national cause. In 1867-78 he was chief clerk of the United States revenue marine bureau for the district of New York. White was particularly known as a Shakespearean scholar. He contributed articles on Shakespeare, to 'Putnam's Magazine' in 1853, in 1854 published 'Shakespeare's Scholar,' and in 1857-63 a critical edition of the

WHITE—WHITE BRETHREN

poet's works. Other volumes on this general subject were, 'Essay on the Authorship of the Three Parts of Henry the Sixth' (1859); 'Memoirs of William Shakespeare, with an Essay toward the Expression of his Genius' (1865), and the posthumous 'Studies in Shakespeare' (1885). White's 'Riverside edition' of Shakespeare (1883) was one of the most popular prepared by an American. He was also one of the leading American critics of his time, dogmatic at times and over-hasty in generalization, but vigorous, acute, and frequently brilliant. Philological studies were represented by his 'Words and their Uses: A Study of the English Language' (1870, rev. ed. 1872), and 'Every-Day English' (1881). The most widely circulated of his writings was the anonymous satire 'The New Gospel of Peace' (1863-6). He also wrote a novel, 'The Fate of Mansfield Humphreys' (1884), and edited 'Illustrated Record of the New York Exhibition of the Industry of All Nations' (1854), and 'Poetry, Lyrical, Narrative, and Satirical of the Civil War' (1866). His scholarship was considerable, his style readable and often marked by satire, and his authority in his day decided. An interesting article regarding him by F. P. Church appeared in the 'Atlantic' for March 1891 (vol. 67).

White, Stanford, American architect: b. New York 9 Nov. 1853; d. New York City 25 June 1906. He was graduated from the University of New York and received his professional training under Charles D. Gambrill and H. H. Richardson, and was the chief assistant of the latter in the construction of Trinity Church, Boston. In 1881 he became a member of the firm of McKim, Mead & White. He was the designer of Madison Square Garden, the Washington Arch, and other important structures.

White, Stewart Edward, American novelist: b. Grand Rapids, Mich., 12 March 1873. He was graduated from the University of Michigan in 1895 and studied law at the Columbia Law School 1896-7. He has published stories of Western life, including 'The Westerners' (1901); 'The Claim Jumpers' (1901); 'The Blazed Trail' (1902); 'Conjuror's House' (1903); 'The Forest' (1903).

White, William, American Protestant Episcopal bishop: b. Philadelphia, Pa., 4 April 1748; d. there 17 July 1836. He was graduated at the College of Philadelphia in 1765, completed his theological studies in 1770, and going to England to obtain holy orders, was admitted to the diaconate by the bishop of London in 1770, and to the priesthood by the bishop of Norwich in 1772. Returning to Philadelphia, he became assistant minister and afterward rector of Christ Church and St. Peter's Church, being at one period the only Episcopal clergyman in Philadelphia, and in 1777 was chaplain to Congress. The degree of D.D., the first honorary degree of the University of Pennsylvania, was conferred on him in 1782. The meeting which issued the summons for a convention preparatory to organizing the Protestant Episcopal Church, was held at his house in 1784 and he presided over the 1st General Convention in 1789. In 1786 he was elected bishop of Pennsylvania and was consecrated in Lambeth palace, England, 1787. He wrote 'Memoirs of the Protestant Episcopal Church' (1820); 'Lectures on the Cate-

chism' (1813); etc. Consult: 'Memoir,' by Bird Wilson (1839); McConnell, 'History of the American Episcopal Church' (1890).

White, William Allen, American author: b. Emporia, Kan., 1868. He was educated at the University of Kansas and in 1890 became editor of the *Eldorado Daily Republican*. He afterward was engaged on the editorial staffs of the *Kansas City Journal* and of the *Star*, and in 1894 purchased the *Emporia Gazette*. His editorial, 'What's the Matter with Kansas?' published in that paper in August 1896 was read and reprinted throughout the country. He has published 'The Real Issue' (1896); 'The Court of Boyville' (1899); 'Stratagems and Spoils' (1901); etc.

White, William Hale, 'MARK RUTHERFORD', English author. Under the pseudonym 'Mark Rutherford' he has published such notable books as 'The Autobiography of Mark Rutherford'; 'Mark Rutherford's Deliverance' (1885); 'Miriam's Schooling' (1890); 'The Revolution in Tanner's Lane' (1887); 'Pages from a Journal' (1900); etc.

White, Sir William Henry, English naval constructor: b. Devonport 2 Feb. 1845. He was educated at the Royal School of Naval Architecture, served in the constructive department of the Admiralty, 1867-83, becoming chief constructor, and from 1870 to 1881 was professor of naval architecture at the Royal School of Naval Architecture and at the Royal Naval College. In 1883-5 he organized and directed the warship building department of Armstrong & Company, Newcastle. From 1885 to 1902 he was director of naval construction and assistant controller of the navy, and during that period was the responsible designer of all British ships of war. Upon his resignation, due to failing health, he received from Parliament a special money grant in recognition of his services to the navy. He has published: 'A Manual of Naval Architecture'; 'Architecture and Public Buildings'; 'A Treatise on Shipbuilding'; and numerous professional papers.

White Ants. See **TERMITES**.

White Bass. See **BASS**.

White Book, a government publication in Germany and Portugal, corresponding to the British Blue Book and the Yellow Book of France. See **BLUE BOOKS**.

White Boys, an illegal association formed in Ireland in 1760, composed of starving day-laborers, evicted farmers, and others in a like condition, who used to assemble at nights to destroy the property of landlords or their agents, the Protestant clergy, the tithe collectors, or any others that had made themselves obnoxious in the locality. In many cases they did not confine their acts of aggression merely to plunder and destruction, but even went the length of murder.

White Brethren, a sect which caused a commotion in Europe about the beginning of the 15th century. A priest whose origin is unknown, his nationality being variously alleged as Spanish, French and Scotch, made his appearance in Lombardy, and said that he was the prophet Elias, and had come back from heaven to give notice of the coming destruction of the world. He had thousands of followers, who were arrayed in white, and carried large cruci-

WHITE CAMELIA, KNIGHTS OF— WHITE CROSS SOCIETY

foxes, as they marched from the Ligurian Alps into central Italy. Pope Boniface IX. caused him to be apprehended, and he was burned as an impostor. The White Brethren then dispersed.

White Camelia, The Knights of the, formed in May 1867 at New Orleans, was the largest of the revolutionary orders called into existence by the misgovernment of Reconstruction. Its principal strength was in the Gulf States, farther south than the Ku Klux Klan. The organization was as follows: a Supreme Council for the United States; a Grand Council in each State; a Central Council in each congressional district; and Councils in each county. Each council was divided into circles and groups. The officers of the council were known as commander, lieutenant-commander, sentinel, secretary and treasurer; with the prefixed adjectives, supreme, grand, or eminent, for the officials of the three higher ranks of councils. The members were called "brothers." The objects of the order were, to nullify radical legislation, to reduce the influence of the blacks in politics, to prevent amalgamation of the races, and to defend the white race against radical encroachment. The members swore to vote for no black for office, to observe always a marked distinction between the races, to maintain the social and political superiority of the white race, at the same time protecting the blacks in the privileges rightfully theirs. The constitution forbade the endorsement of any political party by the order. Each member was free to vote as he pleased, subject to his oath always to oppose negroes for office, or those favorable to negro political rights. The order operated also as a body of regulators using such methods as were usually attributed to the Ku Klux Klan. The membership was of a higher order than that of the Klan; the discipline was good and the order never degenerated so badly as the Ku Klux. The effect of its operations was to control the lawless negroes, intimidate and drive from the country the carpetbaggers, and to secure again to the whites control of the State and county governments. These objects accomplished, the order gradually disbanded. Its secrets were well kept and not until recent years was anything definite known of the order. The White Brotherhood and the White League were closely related orders that existed in the same territory a few years after the White Camelia had disintegrated.

Consult: Brown, 'Lower South in American History' (1902); 'Constitution and Ritual of the Knights of the White Camelia,' in West Virginia University Documents relating to Reconstruction, Nos. 1 and 2.

WALTER L. FLEMING,
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White Caps, in American history, a name applied to lawless bands in southern Indiana, who, from 1880, undertook the regulation of the manners and morals of that section. During the Civil War the Knights of the Golden Circle (q.v.) flourished in the same parts. The white caps dressed differently in different parts of the country which they terrorized. Where they were regularly organized and did the most mischief they generally had nearly a full uniform or regalia. They wore white paper foolscaps, with paper masks, and coats of coffee sacking. To make the coats they merely cut arm or sleeve

holes in the sides of coffee sacks close to the bottoms and holes in the bottoms to put their heads through. The whole White Cap movement was borrowed from English outlawry.

White Cattle (of Chillingham), certain cattle preserved in a semi-wild state in Chillingham Park, England. They are pure white, except the muzzle, which is black, and the horns which are tipped with black. The white color on the body, however, is artificially produced, the owner causing all spotted calves to be killed. They are now generally believed to be the descendants of the mountain bull or urus (see Ox), which was wild in Gaul at the time of Caesar's invasion, and the stock whence modern breeds of domestic English cattle have been partly derived. Dawkins, however, considers them the last surviving representatives of a still more primitive race, the gigantic ox, known by its remains in caves to have occupied Great Britain in the Pleistocene Period. He considers them much modified in every respect by their small range and their contact with man.

White Clover, Oak, Pine, etc. See CLOVER; OAK; etc.

White Colors, in painting, white pigment or white lead. Baryta yields several commercial varieties of white color, largely used for adulterating white lead. The substances used are heavy spar, the native sulphate, and witherite, the native carbonate, of baryta. An artificial sulphate of baryta is also used in permanent white. Zinc white or Chinese white is a hydrated oxide of zinc, and pearl white is yielded by the nitrate of bismuth. A fine chalk yields Spanish white, and whiting is ordinary ground chalk. Quilime is a sanitary white for external walls, etc.

White Cross, a self-supporting American organization, with a large membership throughout the Union, having for its motto, "Truth, Charity and Philanthropy," and for its emblem cross bandages of white on a field of red. It was founded in 1898 by Mrs. Jane Creighton, of Portland, Oregon, and its object is the care of wounded and sick American soldiers and sailors, and aid to the widows and orphans of those who have fallen in battle, or died of disease or accident.

White Cross Society, an association founded in England, in 1883, by the Bishop of Durham, and introduced in the United States in that year by the Rev. B. F. De Costa, rector of the Protestant Episcopal Church of Saint John the Evangelist, New York, who became a Roman Catholic in 1899. The objects of the society are "to urge upon men the obligation of personal purity; to raise the tone of public opinion upon the subject of morality; to secure proper legislation in connection with morality." Those who become members of the society promise "by the help of God," to treat all women with respect, and endeavor to protect them from wrong and degradation; to endeavor to put down all indecent language and coarse jests; to maintain the law of purity as equally binding on men and women; to endeavor to spread these principles, and try to uplift younger brothers, and to use every possible means to fulfil the command, "Keep thyself pure." The society seeks to forward its objects "by the full presentation of those spiritual truths which form distinguishing characteristics of Christianity, and demonstrate its

WHITE-CROWNED SPARROW — WHITE LEAD

unalterable hostility to every form of impurity.³ The society has been established also in Canada.

White-crowned Sparrow. See SPARROW.

White Eagle, Order of. See ORDERS, ROYAL.

White Elephant, an elephant affected with albinism. Such animals, always rare, are highly esteemed by some Eastern potentates, and are considered sacred in Siam, where the animal has become a national symbol, so that Siam is called "the land of the white elephant," and one of the highest decorations conferred by its rulers is that of the Order of the White Elephant. A specimen purchased by the late P. T. Barnum from King Theebaw, of Burma, was brought to the United States in 1884. It stood seven feet and a half high, and the face, ears, front of trunk, fore feet, and part of breast were of a light ash color.

Figuratively, a present which does one much more harm than good, or more generally any nominal advantage which has this effect. It is reported that when in old times the ruler of Siam desired to ruin any one, he made him a present of a white elephant. The sacred elephant has an enormous appetite, and, being sacred, it would be a crime to let it die, so that the gift generally entailed ruin on the recipient.

White-eyes, one of the numerous small insectivorous birds of the New Zealand region, called blight-birds there, because they feed so largely upon the plant-lice which torment garden plants and orchard trees. They belong to the genus *Zosterops*, which is variously classified by ornithologists, but seems most nearly related to the titmice. Other species are scattered elsewhere throughout the Old World tropics. All are neatly but not gaudily dressed, have in most cases a conspicuous ring of white feathers around the eye, and build pretty nests. The genus is interesting, further, from the fact that many of its species are confined to small islands, apparently affording examples of the effect of isolation (q.v.).

White Feather, a symbol of cowardice; a term introduced in the days when cock fighting was in vogue. As a thoroughbred game cock has no white feathers, a white feather was a proof that the bird was not game.

White Fly, a minute insect of the family *Aleyrodidae*, closely allied to the aphids and coccids, which infest the leaves of plants, usually on the lower side, and are pests in greenhouses. (See GREENHOUSE INSECTS.) They are covered with a whitish mealy secretion, and when young also secrete wax. The group is not a large one, and does not do much harm to fruit or forest trees, except that one species (*Aleyrododes citri*) has been prevalent in Florida orange groves since about 1890. The evil they do results not only from their sucking the nutritive juices of the plants, but from the spread of smut-fungus which is promoted by their presence. Consult Howard, 'The Insect-book' (New York 1901).

White Friars, a name formerly given to the friars of Our Lady of Mount Carmel, because they wore a white scapular and cloak over their brown habit. See CARMELITES.

White Goat. See ROCKY MOUNTAIN GOAT.

White Hats, a badge of the Democratic party in Flanders in the 14th century. White

hats were used in England to denote radical proclivities, because Orator Hunt (1773-1835), the great demagogue, during the Wellington and Peel administration, used to wear a white hat.

White Hellebore, a liliaceous plant of the genus *Veratrum*, a source of insect-poison, the principle of which is the alkaloid veratrin. See also HELLEBORE.

White House, the official residence of the President of the United States, in Washington, D. C. The name arose from the fact that the building is constructed of freestone and painted white. It is 170 feet long, 86 feet deep, and two stories in height. It has an Ionic portico, the main entrance faces north. Reception rooms are on the first floor and the private apartments of the President are on the second floor. Among the reception rooms are the Blue Room used for diplomatic functions, the East Room used for public receptions, and the Red and Green rooms. The original official residence for the President was begun in 1792; it was first occupied by Adams, in 1800. In 1814 it was burned by the British, and four years later was rebuilt. In 1903 executive offices connected with the main building were built on the grounds. Presidents Harrison and McKinley used for the official name, "Executive Mansion"; President Roosevelt changed to the old name, White House.

White Lady, an apparition which figures in the legends and traditions of various countries, as presenting itself to give warning of death and other momentous events in royal and titled households. The White Lady is supposed to be an ancestress of the family she visits, and the association of such a legend with a family name is regarded as a guarantee of noble and ancient lineage. The imperial house of Hohenzollern has its White Lady, and Hampton Court, England, is said to be invaded at times by a supernatural visitor, although there seems to be some doubt whether it is a White Lady or the ghost of Henry VIII.

The earliest historical instance of the apparition is recorded as having occurred in the 15th century, and is celebrated under the name of Bertha of Rosenberg, in Bohemia. Similar appearances are said to have been witnessed in the Schloss at Berlin, one as recent as 1879.

As a considerable number of estates of European titled personages are passing into new and plebeian ownership the question has arisen whether the White Lady is transferred with the property, or follows the old family into poorer quarters in some city tenement.

White Lead, a white pigment very largely used in painting. Many processes have been devised for its manufacture, but only the important ones will be described here. The old Dutch method was to expose sheet lead in coils, placed in earthenware jars partly filled with vinegar, to the combined action of air, moisture, and carbonic acid gas. This was done by immersing the jars with their contents in decomposing horse manure which furnished the heat and carbonic acid gas necessary for the process. The English process, which is the one by which most of the white lead is made, differs from the Dutch process by the use of fermenting tan bark instead of manure. The pots containing the lead and dilute acetic acid or vinegar are piled in rows in the so-called stacks and surrounded with the fermenting tan bark. After about three

WHITE LEAGUE — WHITE PLAINS

months the lead is removed and purified. The process is slow and the methods of purification dangerous to the workmen, but the resulting white lead is of the best quality. In the French method a solution of basic lead acetate is first prepared by the action of an impure acetic acid on litharge or lead oxide. Carbonic acid gas is then passed through this solution and the white lead precipitated.

White lead is a basic carbonate of lead of somewhat variable composition. That formed by the Dutch and English processes may be represented by the formula $2PbCO_3 \cdot Pb(OH)_2$.

White League, The, in American history, a popular name for a semi-military organization, gathered to repress the negroes of the State of Louisiana, who, it was asserted, were meditating insurrection. The organization had its inception in New Orleans, in 1874, and on the refusal of the city authorities to allow the landing of a cargo of firearms, which the league had imported from New York, a riot ensued which resulted in more than 100 deaths. The league afterward became a powerful factor in Louisiana politics.

White Metal, a term used for an alloy of lead, antimony, and tin used for bearings in machinery. Also applied to many other alloys that have a white color.

White Monks. See *Bernardines* under *Orders, Religious*.

White Mountains, a group of peaks and hills, or a range of mountains, principally in New Hampshire, in the northern part; but which extend into Maine on the east, and on the west are connected with the Green Mountains in Vermont. They belong to the Appalachian system. Mount Katahdin, in Maine, is the highest elevation on the eastern rim; and in New Hampshire there are about 20 peaks, with deep narrow valleys and long lines of rounded foot-hills. The peaks are in two groups; the eastern or White Mountain group proper and the Franconia group, separated by a tableland varying from 10 to 20 miles in width. The principal summits of the eastern group are, beginning at the Notch and passing around to Gorham, Mounts Webster, Clinton, Pleasant, Franklin, Monroe, Washington, Clay, Jefferson, Adams, and Madison. Of these Mount Washington is the highest, and is indeed the highest mountain summit in New England, being 6,293 feet above the level of the sea. The principal peaks of the Franconia group are Pleasant, Lafayette, Liberty, Cherry, and Moosehillock. Near the southern border of the plateau are Whiteface, Chocoma, Red Hill, and Osagee, and in the southeast, Kearsarge. North of the plateau, and near the upper waters of the Connecticut, are several elevations, among which are the twin mountains known as Stratford peaks. The plateau is deeply furrowed by several streams. The geological formation of the White Mountains is almost entirely of the ancient metamorphic rocks. In many of the peaks the upper portion is composed of huge masses of naked granite or gneiss; and the debris which in the course of ages has clothed the lower portion with a coarse gravelly soil, possesses only enough of the constituents of vegetable life to support those trees and shrubs which will grow in the hardest and poorest soil. Land slides, not the result of a glacier movement, but of dislodgment of boulders and loosely adherent soil after heavy rains, are not infrequent. One of these,

occurred in the notch of the White Mountain group in August 1826, and destroyed a whole family named Willey, consisting of nine persons. The most noteworthy of many waterfalls among the mountains are: the Artist's fall in North Conway; the Silver Cascade, a beautiful thread of water descending from far up the side of Mount Webster; Ripley's falls, on a tributary of the Saco, below the Willey house, the lower one, Sylvan Glade cataract, falling, at an angle of 45°, 156 feet, in a stream from 50 to 75 feet in width; the falls of the Ammonoosuc, which in a course of 30 miles descends over 5,000 feet; the Berlin falls on the Androscoggin, descending over 200 feet in the course of a mile; and the Crystal Cascade and Glen Ellis Fall, near the Glen house, on a tributary of the Androscoggin. Of the "notches," or passages rent through the solid granite of the mountains, apparently by some violent convulsion of nature, there are five; the White Mountain Notch, two miles in length, and at its narrowest point only 22 feet wide, through which the Saco River passes; the Franconia Notch, which permits the passage of the Pemigewasset; the Pinkham Notch, through which a branch of the Saco and one of the Androscoggin find their way; and the Grafton and Dixville notches, through which flow the Androscoggin and one of its tributaries. The first two of these are those best known. "The Flume" at Franconia Notch is the most noted of those narrow waterways excavated through the rock, though there are others hardly inferior to it in attractiveness. Among the other objects of interest in the Franconia group is the "Old Man of the Mountain," a well defined profile of the human face formed by three projecting rocks. (See *FRANCONIA*.) At the base of the mountain lies a beautiful lakelet one fourth of a mile long and one eighth wide, called "Profile lake," or the "Old Man's Washbowl." Five miles south of the notch is the "Basin," a circular bowl-like cavity 45 feet in diameter and 28 in depth, produced by the whirling of large stones in a natural hollow in the rock by the current. It is filled with clear sparkling water, which flows down the mountains in a succession of beautiful clear cascades. The "Pool," in the same vicinity, is a natural well in the solid rock 60 feet in diameter and 190 feet deep, of which 40 feet is water. The White Mountains were first visited by a white man, Darby Field of Pascataqua, in 1642, when with two Indians he ascended Mount Washington. Later in the same year Thomas Gorges and companions traveled up the Saco and explored the mountains and the plateau, and discovered the sources of the Saco, Connecticut, Androscoggin, and Kennebec rivers. The White Mountains are a famous summer resort. Several railroads enter the mountains, and in the seasons special trains carry passengers direct from many of the large cities.

White Oak Swamp, Battle of. See *GLAXDAL, BATTLE OF*.

White Plains, N. Y., village, county-seat of Westchester County; on the Harlem Division of the New York Central & Hudson River Railroad; about 20 miles from the central part of New York city. It is in an agricultural section, and has several manufactories. It has a high school, opened in 1894, graded elementary public and parish schools, Saint John's Academy for

WHITE QUAKERS—WHITE SULPHUR SPRINGS

Boys, Good Counsel Training School, several private schools, and a public library. Bloomingdale Asylum for the Insane occupies a prominent position overlooking the village. The village owns and operates the water-works. The government is vested in a president and board of trustees. Pop. (1910) 15,949.

White Plains and vicinity were the scenes of many battles and skirmishes during the Revolution. Fortifications or their ruins were to be seen on all sides. On 21 October Washington established his headquarters at White Plains. On the evening of 27 October Haslett with about 1,600 American troops had taken possession of Chatterton Hill, a commanding eminence on the west side of the Bronx; and on the morning of the 28th, reinforced by a small additional force under McDougall and two pieces of cannon under command of Alexander Hamilton, he fortified his position as well as time would allow. On the morning of that day Howe advanced with his forces in two columns (numbering about 13,000 men) upon the American army posted along the Bronx. Perceiving the importance of the position on Chatterton Hill, and regarding it as the only assailable point of the American army, Leslie was sent with a strong detachment to cross the Bronx and attack it in front, while Rall with a Hessian regiment was ordered to cross the river a quarter of a mile below and attack Haslett in flank. The hill was carried with great difficulty, the Americans retreating in good order and without being pursued. The British troops rested that night on Chatterton Hill. The next day, 29 October, a skirmish took place between the two armies; but Howe, finding the Americans still too strongly posted to be attacked with safety, waited for reinforcements. These arrived on the evening of the 30th, but a storm coming on, the Americans took advantage of it and withdrew to the still stronger position of Newcastle, two miles above, which they had previously fortified. Afraid to attack them in this position, Howe fell back to the junction of the Harlem and Hudson rivers, and encamped on Fordham Heights; and Washington withdrew his army leisurely into New Jersey and made his headquarters at Hackensack. The loss of the Americans in the battle of White Plains and the skirmish of the succeeding day was nearly 300 in killed, wounded, and prisoners, and that of the British about the same.

White Quakers, a small community of Quakers in Dublin, Ireland, so-called from dressing in white. They are seceders from the main body, and are said to be Antinomian in their belief.

White Ribbon Gospel Army, a Christian society which originated in England in 1884, and has since extended to the United States. It gives special attention to inculcating moral purity.

White River, in Arkansas, has its rise in the Ozark Mountains, in the northwestern part of the State, flows northeast into Missouri, forming a large curve, and entering Arkansas again in Marion County, then flows southeast to the Mississippi River. It enters the Mississippi through several channels, some of which pass through the mouth-channels of the Arkansas River. Except in the highlands of the

Ozark Mountains, the greater part of the course of the river is through marshy forest land. It is navigable to Batesville, about 380 miles. The total length is 800 miles.

White River, in Indiana, the chief branch of the Wabash in the State, is formed by the confluence, in Pike County, of the East and West Fork, which have their rise near the eastern boundary of the State. From the junction of the two forks to the mouth of the White, where it enters the Wabash, is 50 miles; total length from the source of the West Fork is 350 miles. The river is navigable to Martinsville on the West Fork and to Reekford on the East Fork.

White River Junction, Vt., village in Windsor County; on the Connecticut River at the mouth of the White River, and on the Central V., the Boston & M., and the Woodstock R.R.'s; about 65 miles south by east of Montpelier and 14 miles east by north of Woodstock. It is a commercial centre for a large agricultural region in both Vermont and New Hampshire. The National bank has a capital of \$100,000 and deposits amounting to over \$1,275,000; the savings bank has deposits amounting to \$481,150. White River Junction is in the town of Hartford, and the Government Census does not give the population of the village separate. Pop. of town (1890) 2,740; (1900) 3,817; (1910) 4,170.

White Sage. See EUBOTIA; GOOSEFOOT.

White Sea, Northern Russia, a large gulf opening into the government of Archangel, between the Kola peninsula on the west and the Kamin peninsula on the east. Near its mouth, and on the eastern side, is a branch of it called the Gulf of Mezen, which receives the waters of the river Mezen, and the inner part of the sea sends off three large arms, namely, the Gulf of Kandalak, penetrating northwest into Lapland, the Gulf of Onega, receiving the river Onega, and the Gulf of Archangel, into which flows the Northern Dvina. Of the islands in the sea Solovetskii is the largest. The White Sea is comparatively shallow, and is frozen over from October to May. Archangel, at the mouth of the Northern Dvina, is the leading port of northern Russia, and other ports on the shores of the sea are Onega and Kem. Canals connect the White Sea basin with the basins of the Caspian, Baltic, and Black Sea.

White Sulphur Springs, Mont., city, county-seat of Meagher County; about 65 miles east by south of Helena. It is reached by stage from the Northern Pacific Railroad, a distance of about 40 miles. It is the commercial centre of a large agricultural, stock-raising, and mining region, and is noted for its thermal springs. The National bank has a capital of \$100,000. Pop. (1910) 417, which includes only those within the limits and not the number who transact business in the city.

White Sulphur Springs, W. Va., a district in Greenbrier County; on the Chesapeake & Ohio Railroad; about 230 miles west by north of Richmond and 90 miles west of Staunton. The locality has long been noted for its medicinal springs. The temperature of the water is 62° F. It is a famous health-resort. Pop. (1910) 338.

WHITE-SWELLING—WHITEFISHES

White-swelling, any severe disease of the joints resulting from chronic inflammation in the bones, cartilages, or membranes. The knee, ankle, wrist, and elbow are the joints most subject to this form of disease. It is distinguished from simple inflammation of the synovial membrane (synovitis) by the fact that the synovial membrane passes into pulpy degeneration. Amputation is frequently necessary. The disease may be local or constitutional in origin, being in the latter case due to rheumatism, gout, syphilis, pyæmia, etc.

White Whale. See **WHALE**.

Whitebait, the young fry of herring, the sprat and other small marine fishes, 2 to 4 inches long, caught in England as a delicate food. Whitebait, so much celebrated as figuring in the list of dainties of London epicures, has given rise to a great deal of controversy, but it is no longer considered a separate kind of fish, peculiar to the Thames. Its fame was no doubt attained, not so much from the simple quality of its flesh, as from the modes in which it was cooked at Greenwich; and doubtless the fact that it formed a feature in the annual dinner of her majesty's ministers at Greenwich also tended to enhance its reputation. Epicures advise its being cooked as soon as caught. Whitebait are sold in London in June and July.

Whitechapel, London, England, a parish and parliamentary district, east of the nucleus city of London, one of the poorest portions of the metropolis, and formerly notorious for its criminal population. From 1888 to 1891 it was the scene of the atrocities of the mysterious Jack the Ripper. Within its boundaries are the Tower of London, and London Hospital, and it is intersected by Whitechapel Road. The name is derived from a former medieval chapel, whence all distances east of London were calculated.

Whitefield, hwi't'fild, George, English evangelist, founder of the Calvinist Methodists: b. Gloucester 16 Dec. 1714; d. Newburyport, Mass., 30 Sept. 1770. He was sent to the grammar school of Saint Mary de Crypt at Gloucester, and at 18 entered as servitor at Pembroke College, Oxford, where he became acquainted with the Wesleys, and joined the small society which procured them the name of Methodists. Hearing of his devotional tendencies, Dr. Benson, bishop of Gloucester, made him an offer of ordination at 21, which he accepted; and he was ordained a deacon in 1736. Such was his powerful and exciting preaching, that, after his first sermon at Gloucester, a complaint was made to the bishop that he had driven several people mad; on which the prelate observed that he hoped the madness would not be forgotten before the next Sunday. He for some time supplied a curacy at Dummer, in Hampshire but the next account sent him by the Wesleys of their progress in Georgia excited in him a desire to assist in their labors, and he arrived at Savannah in May 1737. Observing the deplorable want of education in the colony, he projected an orphan-house, for which he determined to raise contributions in England, where he arrived in the beginning of 1739. Although disheartened by many of the clergy, Bishop Benson did not scruple to confer on him priest's orders; and on going to London the churches in which he preached were incap-

ble of holding the crowds assembled to hear him. He now adopted the practice of preaching in the open air, which he seems first to have carried out at Kingswood, near Bristol, among the colliers, on whom his discourses produced a surprising effect, and whose vicious manners and habits he visibly improved. He afterward preached in the open air in Bristol, and in Moorfields, Kennington, and other places in the neighborhood of London, to vast assemblages of people. In August 1739, he again embarked for America, and made a tour through several of the provinces, where he preached to immense audiences, with an effect vividly portrayed in the autobiography of Benjamin Franklin. He arrived at Savannah in January 1740, where he laid the foundation of the orphan-house, and after making another extensive tour, returned to England, in March 1741. During his absence his cause had been declining at home, and the differences between him and Wesley on the doctrines of election and reprobation deprived him of many followers. After visiting many parts of England, Scotland, and Wales, where he married in 1741, he again returned to America (1744), and remained there nearly four years. His preaching met with great opposition in New England at this time and Harvard College put forth a "testimony" against him. Returning to England in July 1748 he was soon after introduced to the Countess of Huntingdon, who made him one of her chaplains. A visit to Ireland and two more voyages to America followed, and for several years his labors were unceasing. He preached at Exeter, N. H., the day before his death, and also at Newburyport. He is buried beneath the pulpit of the Federal Street Church at Newburyport. His works were published in 1771-2. Consult Gillies, 'Memoirs' (1772); Gledstone, 'Life and Travels of Whitefield' (1871); Tyerman, 'Life of Whitefield' (1876-7).

Whitefishes, a name given in the United States to various species of salmonoid fishes of the genus *Coregonus* and sometimes to those of *Argyrosomus*, more properly designated ciscoes. *Coregonus* has a comparatively small and nearly toothless mouth, the premaxillary bones broad and with the edge nearly vertical, and the lower jaw short. The thin cycloid scales are much larger than in the salmon and trout, and the caudal fin is deeply forked. Internally, the stomach is horse-shoe shaped and provided with very numerous pyloric caeca, and the swim-bladder is very large. The species, about 15 in number, though some ichthyologists recognize many more, are confined to the clear lakes of the northern portions of the northern hemisphere often extending into the Arctic regions and sometimes there becoming anadromous. Wherever found they are highly valued for food. North America has about eight species. The common whitefish (*C. clupeiformis*) has its centre of distribution in the Great Lakes, but extends into the various lake systems of New York and southern Canada. It reaches a length of two feet and may be distinguished from the related species by its numerous and long gill-rakers, the toothless tongue and the elevated but not compressed back. As generally in the whitefishes, the color is olivaceous above and white below. It receives various local names from the fishermen, such as buffalo-back; and the variety landlocked in Otsego Lake at the

WHITEHALL

head of the Susquehanna River is known as the Otago bass. During the greater part of the year the whitefish remains in the deeper waters of the lake, moving about in schools which change their feeding grounds with considerable regularity. Being toothless they feed only upon small animals, such as crustaceans, snails and insect larvae, the first being by far the most important part of their diet. During the late fall and early winter the schools congregate on the shallows to spawn; in the act of spawning the female rises to the surface and is immediately followed by a male which mingles the sperm with the stream of eggs issuing from her vent. The eggs are about one eighth of an inch in diameter and sink to the bottom, where most of them are eaten by the small fishes and mud-puppies which swarm on the spawning grounds. They develop slowly and require several weeks to hatch, the exact time depending upon the temperature of the water. Each female produces from 10,000 to 75,000 eggs, depending upon her size.

Besides the enemies affecting the eggs and young the adult whitefish are preyed upon by the large pike and lake-trout which follow the schools, and to a less extent by smaller predaceous fishes. The extensive development of the fisheries, which are prosecuted most vigorously at the very season when the spawning fish are most accessible on the shallows, has so depleted the numbers of the whitefish that the fisheries are now dependent upon artificial propagation for their maintenance. The methods are essentially the same as those employed in the artificial propagation of the shad, though many modifications in detail have been found necessary. Hundreds of millions of eggs are now annually taken and hatched under the auspices of the United States and State commissions of fisheries. Such extensive and even greater operations are required to bring these fisheries back to their former importance; for the catch in all of the Great Lakes has steadily fallen from 21,463,900 pounds in 1880 to 12,401,335 pounds in 1890 and 5,094,014 pounds in 1899. The value of the latter was \$297,023. But as the common whitefish has decreased in abundance, other and less esteemed species have assumed an increasing importance so that if the catch of all these in 1899 be taken into consideration the total becomes 78,640,364 pounds, valued at \$1,280,852. Of this 59,913,576 pounds, valued at \$941,067 were lake herring or cisco (*Argyrosomus arcti*). These figures represent the American catch alone and during the same year the Canadian fisheries probably yielded about 40,000,000 pounds more. Whitefish are sold fresh or are frozen immediately after capture and placed in cold storage at a temperature several degrees below freezing and in this condition shipped, especially during the winter, to all parts of the country. Relatively small quantities are also pickled or smoked.

Other species of *Coregonus* are found in the Great Lakes as well as in other lakes particularly northward and westward, but at the present time none are so highly valued as the common whitefish. An important one is the shad-waiver or round whitefish (*C. quadrilateralis*). The genus *Argyrosomus*, however, includes two species of great and increasing importance though inferior in quality to the common whitefish. The genus differs from *Coregonus* chiefly in the projecting lower jaw, larger mouth and

horizontal premaxillary bones. The numerous species are similarly distributed in North America, which has 8, Europe and Asia, and except for their great activity predatory mode of life their habits in general resemble those of the true whitefishes. The cisco whitening or lake herring (*A. arcti*) is about a foot long, bluish or greenish above, with dark, speckled silvery sides. It abounds in shallow waters of the Great Lakes and, as indicated above, is of great commercial value. The moon-eye cisco (*A. hoy*) has a very large eye and the sides are brilliantly silvery. It is about a foot long and is the object of a considerable fishery in the western part of Lake Michigan. It spawns in November in relatively deep water. A third important species of this genus is the blue-fin whitefish (*A. nigripinnis*), distinguished from all of the preceding which have pale fins by the blue-black color of its pectorals, anals and ventral. It attains a length of 18 inches and is plentiful in the deep waters of Lake Michigan and the small lakes of Minnesota and Wisconsin.

Whitefishes seldom take the hook, but are captured by means of pound, trap, and gill nets and to a smaller extent with seines. The pound and trap nets are arranged in lines which sometimes reach to a distance of 10 or 12 miles from shore, while the gill nets are set much farther out in deep water and are weighted to the bottom.

Consult Brown Goode, 'Natural History of Aquatic Animals,' (Washington 1884) and Townsend, 'Statistics of the Fisheries of the Great Lakes,' Report U. S. Fish Com. for 1901.

Whitehall, London, England, a street leading from Parliament Square to Trafalgar Square, containing several public offices, and named after a palace that once stood here. The building known as the Horse Guards, the office of the commander-in-chief of the army, is so called in consequence of being the station where that part of the troops usually do duty. The treasury, near the Horse Guards, is built on the site of part of the old palace; the First Lord of the Treasury, however, has his official residence in Downing Street, where also the cabinet meets. The Admiralty Office contains the offices connected with the administration of the naval affairs of the country. The original Whitehall succeeded a mansion built by Hubert de Burgh before the middle of the 13th century. It afterward came into the possession of the archbishops of York, was inhabited by Wolsey (under the name of York Place), then passed to Henry VIII., and was called Whitehall. Charles I. was executed in front of Whitehall, and he was led to the scaffold out of one of the windows. Oliver Cromwell died in Whitehall. In 1697 the building was destroyed by fire, except the banqueting hall, which had been added by James I., according to a design of Inigo Jones, in 1619. This portion still remains, and chiefly consists of one room, of an oblong form and 40 feet high. The ceiling, representing the apotheosis of James I., was painted by Rubens, and was retouched by Cipriani. This building was long a royal chapel, but it now contains the museum of the Royal United Service Institution.

Whitehall, Ill., city in Greene County; on the Chicago & A., and the Chicago, B. & Q.

WHITEHALL—WHITELOCKE

R.R.'s; about 25 miles southwest of Jacksonville and 63 miles north of Saint Louis. It is in an agricultural and stock-raising region, and in the vicinity are deposits of fire clay. The chief manufactures are flour, sewer-pipe, tiles, stoneware, and machinery. Its shipping trade is chiefly in farm and dairy products, live-stock and clay products. There are six churches, a high school, and library. The two banks have a combined capital of \$100,000. Pop. (1910) 2,854.

Whitehall, N. Y., village in Washington County; on Lake Champlain, Poultney River, the Champlain Canal, and the Delaware and Hudson Railroad; about 75 miles north by east of Albany. It is at the foot of Skene's Mountain, in a narrow valley. It has railroad shops, silk and knitting mills, grist mills, lumber mills, and machine shops. It has a high school and a library. The bank has a capital of \$50,000 and deposits (1903) of nearly \$700,000. The village owns and operates the water-works. The government is vested in a board of trustees and a president chosen annually by popular vote.

In 1761 Whitehall was settled by Major Philip Skene and a colony of about 30 families; in November 1763 it was incorporated. When differences arose between America and England, which culminated in the Revolution, Skene joined the British and the Americans took possession of his property. An American garrison was stationed at Whitehall in 1776; but fearing capture by Burgoyne, they destroyed the fort, and the houses, and abandoned the place. At the close of the war nearly all the people returned and claimed their former holdings. The whole of the Skene property was sold at auction, and the highest bidder gave £11 10s. In 1812, when the Lake Champlain towns and villages were again near the centre of danger, a fort and block house was built. In 1819 the Champlain Canal was built from Whitehall to Fort Edward, and five years later it was extended to Troy. Pop. (1890) 4,434; (1900) 4,377; (1910) 4,917.

Whitehaven, England, a seaport and important coal-mining centre in Cumberland, situated on a bay of the Irish Sea, 40 miles southwest of Carlisle. It is well built, and has a townhall, custom-house, market-house, public library, public baths, with swimming-pond; a theatre, etc., a good harbor and a deepwater floating-dock. There is a considerable shipping trade, coals, iron-ore, pig-iron, steel rails, etc., being exported and American and other produce imported. The manufactures comprise sail-cloth, cordage, anchors, nails, cement, alabaster, earthenware, candles, and soap. Iron ship-building also is carried on, and there are blast-furnaces, iron- and brass-foundries, engineering works, flour- and saw-mills, breweries, a tannery, etc. There are here extensive coal and iron mines, in which a large number of the inhabitants are employed. The coal-mines, which have been worked since the 17th century, extend some miles under the sea, and coal is wrought beneath the town.

Whitehead, Charles, English poet: b. London 1804; d. Melbourne, Australia, 5 July 1862. He was engaged in a London mercantile house until 1857 when he went to Australia and entered journalism. He was the author of numerous poems, plays, and sketches, among

which are: 'The Solitary' (1831); 'The Autobiography of Jack Ketch' (1834); 'The Cavalier,' drama (1836); 'Richard Savage' (1842) subsequently dramatized; 'Smiles and Tears, or the Romance of Life' (3 vols. 1847); 'Life and Times of Sir Walter Raleigh' (1854); etc. Consult Mackenzie Bell, 'Charles Whitehead, a Forgotten Genius' (1884).

Whitehead, Cortlandt, American Protestant Episcopal bishop: b. New York 30 Oct. 1842. He was graduated from Yale in 1863 and from the Philadelphia Divinity School in 1867. Ordained to the priesthood in 1868 he was engaged in pastoral work in Colorado for three years and was rector of the Church of the Nativity, South Bethlehem, Pa., 1870-82. In January 1882, he was consecrated bishop of Pittsburgh.

Whitehead, William, English poet: b. Cambridge 1715; d. London 14 April 1785. He was educated at Winchester and Clare Hall, Cambridge, was appointed secretary and registrar of the order of the Bath in 1755, and in 1757 was appointed poet-laureate, in succession to Colley Cibber (q.v.). His identity is frequently confused with that of the satirist Paul Whitehead. He was the author of the tragedies: 'The Roman Father' (1750); and 'Creusa, Queen of Athens' (1754); the comedy 'The School for Lovers' (1762); a farce 'The Trip to Scotland' (1770); and numerous minor poems. His collected works were edited and published with a memoir by William Mason (1788).

Whitehouse, Henry Remsen, American diplomat: b. New York 17 Aug. 1857. He was educated in the United States and in Europe, was engaged in the United States diplomatic service in 1882-96, and has written: 'Sacrifice of a Throne' (1897); 'Collapse of the Kingdom of Naples' (1899-1902); etc.

Whiteing, Richard, English journalist and novelist: b. London 27 July 1840. He was educated privately and began his career in journalism in 1866 with a series of satirical sketches on social and political topics afterward republished as 'Mr. Sprouts—his Opinions' (1867). He was subsequently engaged on the *Morning Star* as leader-writer, and was afterward Paris correspondent for various New York, London, and Manchester papers, but returned to London to join the editorial staff of the *London Daily News*, a position he resigned in 1899. He has written: 'The Democracy' (1876); 'The Island' (1888); 'No. 5 John St.' (1899); 'The Life of Paris' (1900); 'The Yellow Van' (1903); etc.

Whitelocke, hwt'lsk, Bulstrode, English statesman: b. London 2 Aug. 1605; d. Chilton Park, Wiltshire, 28 Jan. 1676. Educated at Oxford he studied law at the Middle Temple, was called to the bar in 1626, and entered Parliament as member for Stafford. He was elected to the Long Parliament of 1640 from Great Marlow, was chairman of the committee for drawing up Stafford's charges of impeachment, and one of the commissioners appointed to treat with the king at Oxford. As a member of the Westminster Assembly (1643) he opposed the adoption of Presbyterianism, and as a commissioner of the Great Seal (1649) withheld consent to the king's death. In 1623 he was

WHITESTONE—WHITING

ambassador to Sweden, where he concluded a treaty with Queen Christina, and on his return was speaker of the House of Commons (1656), and one of Cromwell's lords (1657). From his MSS. have been published 'Memorials of English Affairs from the Beginning of the Reign of Charles I. to the Restoration' (1682, new ed. 1852); 'Memorials of English Affairs from Brute to the End of the Reign of James I.' (1709); 'Journal of the Swedish Embassy' (1772, new ed. 1845), and other works.

Whitestone, N. Y., in New York city, borough of Queens. The village was a place of importance, on account of its good harbor, and its position near the eastern entrance to New York Harbor. It is near the United States military post at Willett's Point, and Fort Schuyler, on Throgg's Neck. Pop. (1910) 3,000.

White-throat, a bird, either of two species of Old World warblers—*Curruca cinerea*, the greater, and *C. sylvicola*, the lesser whitethroat; or a hummingbird (*Leucochloris albicollis*) of Brazil; or a white-throated sparrow (*Zonotrichia albicollis*), commonly known in the eastern United States, where it is a migrant, as Peabody-bird.

Whitewash, a milky fluid produced by mixing good slaked lime with water. Used as a cheap coating for walls, fences, etc. When mixed with a little size and sometimes colored it is used on interior walls under the name of calcimine.

White-water, Wis., city in Walworth County; on the Whitewater River, and on the Chicago, Milwaukee & Saint Paul Railroad; about 46 miles southeast of Madison and 50 miles southwest of Milwaukee. It is in an agricultural and stock-raising region and has creameries, paper mill, wagon works, sash and door factories, flour mill, machine shops, and furniture factory. It has a State normal school, a high school, opened in 1886, public and parish schools, and a public library. The two banks have a capital of \$150,000 and deposits amounting to \$1,118,740. Pop. (1890) 4,359; (1900) 3,405; (1910) 3,700.

Whitewood. See **LINDEN**.

Whitfield, hwt'feld, or **Whitfield**, Henry, English clergyman: d. Winchester, England, about 1658. Of the date of his birth and his early life nothing is definitely known. He appears to have been appointed to the living of Ockley, Surrey, in 1616, but having protected several Puritan clergymen during the Laudian persecution incurred the displeasure of Laud, which was further increased by his refusal to read to his parishioners from the 'Book of Sports.' He therefore emigrated to New England in 1637 with many followers and was one of the founders of Guilford, Conn. In 1650 he returned to England and was minister at Winchester. His writings include: 'Some Helpe to Sturre up to Christian Duties' (3d ed. 1636); 'The Light Appearing more and more toward the Perfect Day, or a Farther Discovery of the Present State of the Indians of New England concerning the Progress of the Gospel amongst them' (1641); and 'Strength out of Weakness' (1652).

Whitfield, Robert Parr, American geologist: b. New Hartford, N. Y., 27 May 1828. He

studied natural history and geology unaided, was assistant on the New York State geological survey in 1856-76, and in 1872 was attached to the United States Geological Survey. He was instructor in geology at the Rensselaer Polytechnic Institute in 1872-5, professor in 1875-8 and since 1887 has been curator of the American Museum of Natural History in New York.

Whitgift, John, English prelate: b. Great Grimsby, Lincolnshire, about 1530; d. Lambeth 20 Feb. 1604. He was educated at Pembroke Hall, Cambridge, and after the accession of Elizabeth took holy orders (1560), and was made chaplain to Cox, bishop of Ely. In 1563 he was appointed Lady Margaret professor of divinity at Cambridge, in which office he gained a high reputation by his lectures on the book of Revelations and the Epistle to the Hebrews, and in 1567 was elected master of Pembroke Hall. Soon after the queen made him her chaplain and master of Trinity College, Cambridge, and the same year he also became regius professor of divinity. He was made dean of Lincoln in 1571, and in 1576 bishop of Worcester, and, being also vicepresident of the marches of Wales, made constant use of both the temporal and spiritual powers to put down Roman Catholicism and Puritanism within the limits of his jurisdiction. In 1583 he became archbishop of Canterbury, and soon exacted from every clergyman in the church a subscription to the three points of the queen's supremacy, the lawfulness of the common prayer and ordination service, and the truth of the whole 39 articles. Making use of the court of high commission he removed from positions in the church all non-conformists. In 1585 the star chamber, at his instigation passed ordinances for the regulation of the press, by which no one was allowed to print except in London, Oxford, and Cambridge; the number of printers was to be determined by the ecclesiastical commissioners; and none but a few special printers were to be suffered to print any book, matter, or thing whatsoever until it should be perused and allowed by the archbishop of Canterbury and the bishop of London; and every one selling books contrary to the intent of the ordinance was to be imprisoned for three months. In 1586 he was sworn of the privy council, and framed the statutes of cathedral churches. The hospital and grammar school at Croydon were founded by Whitgift. Consult *Lives* by Strype (1718) and by Sir George Paule (1612).

Whiting, hwi'ting, Arthur Butts, American musician: b. Cambridge, Mass., 20 June 1861. He is well known as a pianist and as a composer of orchestral and chamber music as well as of numerous songs and pianoforte pieces.

Whiting, George Elbridge, American musician and composer: b. Holliston, Mass., 14 Sept. 1842. He early displayed musical talent; and was engaged as an organist successively at Hartford, Conn., Boston, and at Albany. He studied in Europe in 1863 and in 1872, was organist at the Church of the Immaculate Conception, Boston, in 1876-78, and has occupied that position since 1883. In 1878-83 he was organist at the Cincinnati Music Hall and professor of organ and composition at the Cincinnati College of Music. He was engaged as a

WHITING—WHITLOCK

teacher in the New England Conservatory of Music for several years but resigned in 1897. His compositions include: 'Grand Sonata'; 'Tale of the Viking'; 'Dream Pictures, Cantata'; 'Midnight, Cantata'; a one-act opera in Italian, 'Lenora' (1893); and numerous pre-udes, symphonies, etc.

Whiting, Lillian, American author: b. Niagara Falls, N. Y., 3 Oct. 1857. She engaged in journalism in Saint Louis, Mo., in 1876, in 1880-90 was literary editor of the Boston 'Traveler' and was editor of the Boston 'Budget' in 1890-93. Her published books include: 'From Dreamland Sent' verse; 'The World Beautiful' (3 vols., 1894-6-8); 'A Study of the Life and Poetry of Elizabeth Barrett Browning' (1899); 'Kate Field: a Record' (1899); 'The World Beautiful in Books' (1901); 'Boston Days' (1902); etc.

Whiting, Ind., town in Lake County; on Lake Michigan, and on the Pennsylvania Railroad; about 16 miles southeast of Chicago. It has a good harbor and steamer connections with the Lake Michigan ports. It has a large oil refinery, machine shops, and several industrial establishments connected with refining and shipping petroleum and with shipping farm products. In 1900 (government census) the manufacturing establishments, though small in number, were capitalized for \$12,701,598, and the value of the annual products was \$16,674,285. The two banks have a capital of \$100,000. Pop. (1910) 6,587.

Whiting, a name applied to several quite unrelated fishes probably in allusion to the noteworthy whiteness of their flesh, or, in some cases, of the skin of the lower parts. In the United States, and more especially in the South, several species of *Menticirrhus*, a genus of *Sciaenidae*, are known as whiting, but more widely as kingfishes (q.v.). The common whiting (*M. americanus*) reaches a length of about a foot; the body is elongated and slender with a high spinous dorsal and a long low soft dorsal fin, an undulate caudal fin, and is completely covered with ctenoid scales; the outer row of teeth of the upper jaw are enlarged and strong and the color silvery gray with faint oblique dusky bars. It is very common along sandy shores of the entire Gulf coast and on the Atlantic coast northward to about the mouth of Chesapeake Bay and southward to Brazil. Though remaining on these coasts throughout the year they are most plentiful in summer when they frequent the bays and estuaries, but prefer strong currents and the deeper waters. They feed upon crabs, shrimps and other crustaceans and being vigorous biters and gamy fighters, afford splendid angling. Great numbers are caught on lines for the market and the flesh is unusually firm, delicate, and well-flavored. Spawning is said to occur in May. The surf whiting (*M. littoralis*) is so called because, unlike the last, it frequents shallow waters along sandy shores and is captured in large quantities by means of seines. The outer teeth of the upper jaw are not enlarged; the gill-rakers are better developed than in the common whiting; and the black tip of the caudal fin is another mark of distinction. The common northern kingfish (*M. saxatilis*) also extends into southern waters, and is there con-

fused with the above species under the name of whiting. It may be recognized by its dusky color and the distinct, dark bands which cross the sides obliquely. Other species occur on the Pacific coast. By the New England fisherman the name of whiting or silver hake is given to a common species of the cod family (*Gadidae*), the *Merluccius bilinearis* of American ichthyologists, though many European authorities fail to distinguish it from the Old World *M. vulgaris*. From the great majority of the cods the whiting is distinguished by the total absence of a chin-barbel and by the peculiar excavated area of the top of the skull; the second dorsal and the anal fin are long and each divided nearly in two by a deep notch. The body is elongated and covered with small scales; the color grayish silvery white below. This whiting is common in waters of moderate depth along the shores of New England and somewhat northward, and extends southward in deep water to Virginia and even to the Bahamas. Unlike most of the *Gadidae*, which are essentially bottom-feeders, it is an active, roving species, which comes to the surface to pursue and feed upon herring and other fishes. Sometimes large schools appear on our coasts and many are captured in purse-seines and pound-nets. Spawning takes place at the bottom on the edge of the continental slope. Owing to its comparatively small size and the softness of its flesh it is one of the least important economically of the family.

The European whiting (*M. vulgaris*) is scarcely distinguishable from ours, but has much smaller scales, fewer spines in the first dorsal fin and larger teeth. It frequents shallower water and is very abundant along the northern coasts of Europe. It makes its appearance in vast shoals, keeping at a short distance from the shore, and is taken by the line in great numbers. It is considered the most delicate and most wholesome of all the species of cod; but it does not attain a large size, usually not exceeding a foot in length and under a pounds in weight. The food of the adults consists chiefly of fishes and of the young of shrimps and other crustaceans. Spawning occurs in, and the young frequent, the shore waters. As long as the young feed chiefly on the bottom they retain a chin-barbel, but as their habits change this degenerates and finally disappears. Other fishes sometimes called whiting are the hog-fish, har-vest-fish, and a whitefish (qq.v.).

Whiting, a preparation of white chalk from which the grosser impurities have been removed. It is extensively used in the arts, also for cleaning silver and making putty.

Whitlock, hwt18k, Elizabeth Kemble, English actress, fifth child of Roger Kemble (q.v.), b. Warrington, Lancashire, 2 April 1761; d. 27 Feb. 1836. She first appeared at Drury Lane theatre in February 1783, as Portia. In 1785 she was married to Charles Edward Whitlock, a provincial manager and actor, and seven years later accompanied her husband to this country, where they performed for many years in the principal cities. Mrs. Whitlock became the most popular actress of the day in America, and in Philadelphia frequently performed before President Washington and other distinguished persons. She returned to England in 1807 with a competency, and thenceforth retired from the

WHITMAN

stage. In personal appearance and voice she is said to have strongly resembled her sister, Mrs. Siddons.

Whitman, Charles Otis, American zoologist: b. Woodstock, Maine, 14 Dec. 1842. He was graduated from Bowdoin in 1868, studied at Leipsic, and in 1880-1 was professor of zoology at the Imperial University, Tokio, Japan. He was engaged in further studies at the Naples Zoological Station in 1882, and in 1883-5 was assistant in zoology at Harvard. He was director of the Allis Lake Laboratory, Milwaukee, in 1886-9, and in 1889-92 professor of zoology at Clark University, Worcester, Mass. He became director of the Marine Biological Laboratory at Woods Hole, Mass., upon its foundation in 1888, and since 1892 has been at the head of the department of zoology at the University of Chicago. He was elected to the National Academy of Sciences in 1895. He founded the *'Journal of Morphology'* in 1887, and since 1883 has been editor of the microscopical department of the *'American Naturalist'*. He has made a specialty of the development of the vertebrates and of the structure and development of worms. His writings include: *'Methods of Research in Microscopical Anatomy and Embryology'* (1885); *'Biological Lectures'* (1890-5); *'The Inadequacy of the Cell Theory of Development'* (1893); *'Animal Behavior'* (1898); etc.

Whitman, Marcus, American missionary and pioneer: b. Rushville, N. Y., 4 Sept. 1802; d. near Walla Walla, Or., 29 Nov. 1847. After studying medicine at the Berkshire Medical Institution, Pittsfield, Mass., he practised in Canada for four years. He offered his services as a missionary (1834) to the American Board of Commissioners for Foreign Missions, and in 1835 went with Samuel Parker to explore the region of the Oregon, but did not go beyond Green River. In 1836, having married, with his wife and three fellow missionaries he set out to work among the Indians of the upper Columbia. The party crossed the plains by wagon, being the first persons to reach the Pacific coast by this means. On 1 May they reached the Columbia River, and located themselves near the site of the present Walla Walla, Wash. They were soon followed by a large number of emigrants, who settled in what was then known as Oregon, and now forms the States of Oregon, Washington, and Idaho. At this time the Hudson Bay Company was using every possible means to secure this territory to the English. When this plan became evident to Whitman he decided to take every precaution to forestall it. The Ashburton Treaty was then before Congress, and was expected to settle the Oregon question. In 1842-3 Whitman traveled over 3,000 miles to the East on horseback, enduring all the hardships of a Western winter in the mountains, and according to the statement of H. H. Spalding, one of his missionary companions, he reached Washington (3 March 1843) only to find that the treaty had been signed, but that the Oregon question had not been included. Whitman, as Spalding's version represents, at once went to work to show the government the value of the land it had deemed worthless, demonstrated to the people the fertility of the soil of Oregon, and the fact that it could be reached by wagon, and then returned

at the head of a large body of emigrants. By his daring ride and earnest endeavors Whitman, in this view of the matter, won this great section for the United States, and the results of his work were secured by the treaty of 1846. This claim, however, has been the subject of much controversy, and to the satisfaction of some students has been disproved. Whatever its merits, there is no doubt that Whitman's ride (he reached Boston 30 March 1843) resulted in the reversal of the missionary board's purpose to discontinue the southern branch of the mission in which he was engaged; and his work and that of his companions has a historical relation to the American settlement of the Oregon country. Whitman, his wife, and 12 of their companions were massacred by the Cayuse Indians. Consult: Nixon, *'Life of Marcus Whitman'* (1895); Mowry, *'Marcus Whitman'* (1901); and Bourne, *'Essays in Historical Criticism'* (1901), in which the Whitman claims are examined and discredited. See OREGON; OREGON QUESTION, THE.

Whitman, Sarah Helen Power, American poet: b. Providence, R. I., 1803; d. there 27 June 1878. She was married to John W. Whitman, a Boston lawyer; was once engaged to Edgar Allan Poe, afterward writing a defense of him entitled *'Edgar A. Poe and His Critics'* (1866); contributed numerous critical articles and poems to periodicals, and was noted for her conversational powers. Her verse was in part collected in the volume *'Hours of Life, and Other Poems'* (1853), and fully in the posthumous *'Poems'* (1879). *'Fairly Ballads'* and some other works were written with her sister, Anna M. Power. Her finest poem, *'A Still Day in Autumn'*, has much melody and beauty of expression and retains an honored place in anthologies.

Whitman, Walt (originally WALTER), American poet: b. West Hills, Long Island, New York, 31 May 1819; d. Camden, N. J., 26 March 1892. He was educated in the public schools of Brooklyn, and learned the printer's trade, teaching also in several country schools in Long Island. For a brief period he edited several newspapers, until in 1847-8 he made an extensive pedestrian tour as a workman through the United States and Canada, subsequently employing himself as a carpenter and builder. His first and chief work, *'Leaves of Grass'*, was published by himself at New York in 1855. This thin volume of 94 pages was received, for the most part, with abuse, mainly because of its unconventional metrical style, and the freedom with which the poet dealt with moral and social subjects. During the American Civil War, Whitman's brother was wounded on the battlefield, and the poet, who hastened to his aid, remained afterward as a volunteer army nurse at Washington and in Virginia for the years 1862-5. One result of this experience was the small volume *'Drum Taps'* (1865), subsequently included with *'Leaves of Grass'*. After the war he held a government clerkship in Washington, but the fatigue and mental strain of his labors in the hospitals brought about a severe attack of paralysis in 1873. He was recovering from this when the sudden death of his mother in his presence caused a serious relapse. From this time he resided at Camden, N. J., remaining more or less of an invalid until

WHITMAN — WHITMAN COLLEGE

his death. During all these years Whitman continued to write with the old vigor and freedom of rhythm, but with less of the early crudeness of expression. Though Whitman, like Carlyle and Browning, may be a dangerous and dangerously easy model for imitation, he undoubtedly worked out for himself a style of distinction as notable as theirs. This in itself is a title to fame, or at least a charm against oblivion, even though his style, like that of Lyly, runs to extremes and vices. This style or form is a rhythmic recitative or irregular chant, precursors of which may be found in the English translation of the Psalms and other Biblical poems, in Macpherson's 'Osaiian,' and in the later poems of William Blake. These chants vary in movement and seem governed by laws rhythmic rather than metric, which (like the grammar of an unwritten tongue) have never been formulated even by the inventor himself. They have a peculiar, wild, stirring charm, which is apt, for a time, to make regular verses seem tame and insipid after them. As to subject, Whitman set himself the Atlantean task of uplifting into the sphere or dominion of poetry the whole of modern life and man, omitting nothing, concealing nothing. His thesis is that of Saint Peter's vision: "There is nothing common or unclean." Hence the logical necessity with Whitman to include the treatment of subjects which in modern society are tabooed as obscene and unmentionable; hence, too, the accusations of indecency, so just and pertinent from the accuser's point of view, but so futile and irrelevant from that of the accused. Whitman is in fact an idealist who has bound himself by a solemn vow to be a thorough-going realist; and his resolute and often successful endeavor to secure this union gives his work its exceptional artistic quality. He is a prince of impressionists in literature. But so hard and high is the task that he sets himself that it is no matter of surprise that he sometimes, if not often, fails, and from heights where he was approaching the sublime falls seriously near the ridiculous. This is the fate of all artists who strive for the highest things, that their failures—often only apparent—are more easily detected than their solid achievements; hence the contumely and ridicule that a Turner or a Wordsworth, Keats, or Shelley suffers at the hands of a clever but uninitiated criticism. So largely with Whitman; but it is better to approach him in the same spirit that he has shown toward man and nature, that of for ever seeking for what is great and good, while outfacing steadily and bravely every stern and refractory reality. Besides the two books already mentioned, he published 'Drum-Taps' (1865); 'Memoranda During the War' (1867); 'Democratic Vistas' (1870); 'Passage to India' (1870); 'After All, Not to Create Only' (1871); 'As Strong as a Bird on Pinions Free' (1872); 'Two Rivulets' (1873); 'Specimen Days and Collect' (1883); 'November Boughs' (1885); 'Sands at Seventy' (1888); and 'Good-bye, My Fancy' (1892).

The 'Conservator,' of Philadelphia, is the organ of Whitman study. Consult: 'Autobiographia,' selected from the poet's writings (1892); Burroughs, 'Whitman as Poet and Person' (1866); Bucke, authorized 'Life' (1883); Burroughs, 'Whitman: A Study' (1896);

O'Connor, 'The Good, Gray Poet' (1866); Dowden, 'Studies in Literature' (1878); Symonds, 'Essays, Speculative and Suggestive,' Vol. II. (1890).

Whitman, Mass., town in Plymouth County; on the New York, New Haven & Hartford R.R.; about 15 miles northwest of Plymouth and 20 miles south by east of Boston. The chief manufacturing establishments are boot and shoe factories, paper and wood box factories, tack and nail works, and steel shank factory. In 1900 (government census) Whitman had 65 manufacturing establishments which were capitalized for \$2,054,815, and in which were 2,161 employees to whom were paid annually \$1,192,401. The value of the annual finished products was \$5,009,786. It has seven churches, public schools, and a public library. There are two banks, one national and one savings bank. The government is administered by annual town meetings.

The town was originally a part of Abington, but was set off in 1875 and incorporated as South Abington. In 1886 the present name was adopted. Pop. (1910) 7,292.

L. B. SLATCH,
Editor of 'Whitman Times.'

Whitman College, located at Walla Walla, Wash. It was founded by Cushing Ellis as a memorial to Marcus Whitman (q.v.); it was chartered in 1859 as Whitman Seminary, but was not open to students till 1866; in 1882 the courses were extended, the standard raised, and a new charter obtained in 1883 by which the name was changed to Whitman College. For several years the college was aided by the American College and Education Society of Boston, in 1893 Dr. D. K. Pearsons of Chicago offered to give \$50,000 if the college would raise \$150,000 for the same purpose. The conditions were met, and in 1902 Dr. Pearsons added another \$50,000 to the endowment. Women are admitted on equal terms. The organization includes in addition to the College Department, the Conservatory of Music and the Academy. The college confers the degrees of bachelor of arts, bachelor of letters, bachelor of science, and bachelor of music. Certain studies, including Biblical literature, are required for all courses; Greek is required for the H.B. degree, French or German for the B.L. and B.S. degrees, and one year's work in theory of music, history of music, harmony, and counterpoint for the music degree. Each student by the end of the Freshman year must elect a major study in which three years' work must be done; the major for the B.S. degree must be in mathematics or a science. The rest of the required number of hours are free electives. Courses in pedagogy are included in the curriculum. Practical music work does not count toward a degree in the above mentioned courses; but in the Conservatory the degree of bachelor of music is conferred on students who hold a bachelor's degree and complete the regular music course. There are 20 scholarships, and one loan fund; students are also aided in securing employment. The students maintain Christian Associations, literary societies, and an oratorical association; glee clubs, athletic associations, and a general organization known as the 'Associate Students'; the college is affiliated with the Inter-Collegiate Debating Association, and the Inter-

WHITMARSH — WHITNEY

Collegiate Athletic Association. The campus consists of 27 acres near the centre of the city and includes a small lake. The buildings include the Whitman Memorial, Billings Hall (men's dormitory), Reynolds Hall and Prentiss Hall (women's dormitories), Association Hall, the Conservatory, and the gymnasium; plans for a new gymnasium were constructed during 1904 and 1905. The library in 1910 contained 18,000 volumes; the students numbered 240, of whom 78 were in the College Department, and 162 in the Conservatory of Music.

Whitmarsh, Hubert Phelps, American journalist: b. Madoc, P. O., 10 Aug. 1863. He was a druggist in New York and Boston in 1887-1900, and in the latter year became the representative of the 'Century' in Cuba. He subsequently went to the Philippines for the 'Outlook' and in 1900-01 was governor of Benguet, P. I., resigning in the last named year. He has published: 'The World's Rough Hand'; 'The Golden Talisman'; 'Mysterious Voyage of the Daphne'; 'The Young Pearl Divers'; etc.

Whitney, hwit'n'l, Adeline Dutton Train, American author: b. Boston, Mass., 15 Sept. 1824, d. Milton, Mass., 21 March 1906. She was married to Seth D. Whitney of Milton, Mass., in 1843. Although a frequent contributor to different periodicals during her earlier years, her real literary career did not begin until 1850, and her best work was done in the two following decades. Her writings, which are chiefly for young people, are wholesome in tone and entertaining in style, and include, among many others: 'Footsteps on the Seas, a Poem' (1857); 'Boys at Chequasset' (1862); 'Faith Gartney's Girlhood,' which first brought her into general notice (1863); 'A Summer in Leslie Goldthwaite's Life' (1866); 'Patience Strong's Outings' (1868); 'Hitherto: A Story of Yesterdays' (1869); 'Real Folks' (1871); 'Pansies,' verse (1872); 'Sights and Insights' (1876); 'Bonnyborough' (1885); 'Bird Talk,' verse (1887); 'A Golden Gossip' (1890); 'Friendly Letters to Girl Friends' (1897); etc.

Whitney, Anna, American sculptor and poet: b. Watertown, Mass., September 1821. She contributed to magazines and newspapers considerable verse of high quality collected in 1859 in a volume of 'Poems.' In 1860 she began work as a professional sculptor, opening a studio at Watertown, whence, after four years of study abroad, it was transferred in 1872 to Boston. Among her works are the statue of Samuel Adams for the Capitol at Washington, a bronze replica of which stands in Adams square, Boston; one of Lief Erikson in Boston (replica in Milwaukee, Wis.); and many designs and studies, including 'Roma,' an enlarged copy of which was exhibited at the Columbian exposition.

Whitney, Asa, American inventor and manufacturer: b. Townsend, Mass., 1 Dec. 1791; d. Philadelphia 4 June 1874. As a boy he worked at the blacksmith's trade, also became a machinist, and afterward manufactured machinery in Vermont and at Brownsville, N. Y. In 1830 he was appointed master machinist of the Mohawk & Hudson railroad shops, and three years later became superintendent of the road. In 1839-41 he was a State canal commis-

sioner in New York, and in 1842 removed to Philadelphia, where he entered into partnership with Matthew Baldwin in the building of locomotives. In 1847 he perfected a process for annealing cast-iron carwheels, and began to manufacture them extensively. By his further improvements in carwheels, etc., he did much to increase the convenience and safety of railroad service, and travel. He left \$50,000 to the University of Pennsylvania to found a chair of dynamical engineering.

Whitney, Casper, American journalist and author: b. Baltimore, Md., 2 Sept. 1861. He was graduated from Saint Mathew's College, California, spent several years in traveling and hunting, acting as correspondent for 'Harper's Weekly' during much of the time and writing on outdoor sports. He is now (1904) editor of 'Outing.' His writings include: 'A Sporting Pilgrimage'; 'On Snowshoes to the Barren Grounds'; 'Hawaiian America'; etc.

Whitney, Eli, American inventor: b. Westboro, Mass., 8 Dec. 1765; d. New Haven, Conn., 8 Jan. 1825. He was graduated at Yale in 1792; while there having paid his expenses partly by teaching, partly by mechanical labor. He went to Georgia as a teacher, but finding a patron in the widow of General Nathaniel Greene, of the Revolutionary army, he resided on her estate and studied law. The cotton culture at this period, especially that of the best kind, the green-seed cotton, was limited by the slow and difficult work of separating the cotton from the seed by hand. Whitney set to work to remedy this by inventing a machine, but worked under great disadvantages, for he had to make his own tools. Reports of his success prompted some lawless people to break into his workshop and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defense of his rights carried off all his profits and \$30,000 voted him by the State of South Carolina. Finally in 1798 he got a government contract for the manufacture of firearms, and was the first to effect the division of labor by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Conn.; while he received little credit for the perfection of the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. See COTTON; COTTON-GINNING MACHINERY.

Whitney, Henry Howard, American military officer: b. Glen Hope, Pa., 25 Dec. 1866. He was graduated from West Point in 1892, and was on special duty at the War Department in 1896-8. In the last named year, under orders from the secretary of war, he disguised himself as an English sailor, communicated with General Gomez, and made a military reconnaissance of the island of Porto Rico, thereby gaining the information upon which General Miles based the campaign on that island. He was captain of volunteers in 1898-9, served through the Spanish War as captain and assistant adjutant-general on the staff of General Miles, and in 1899 was appointed lieutenant. He accompanied General Miles in his tour around the world in 1902-03.

Whitney, Josiah Dwight, American geologist, brother of W. D. Whitney (q.v.): b.

Eli Whitney

Northampton, Mass., 23 Nov. 1819; d. Lake Umbagog, N. H., 18 Aug. 1896. He was graduated at Yale in 1839, and spent the years 1842-7 in study in Europe, and then explored, with J. W. Foster, the Lake Superior region. Their 'Synopsis' of the explorations was published in 1849 and their 'Report' on the geology 1850-1. He was appointed State chemist and professor in the Iowa State University in 1855 and State geologist of California in 1856. He labored on the survey of that State till 1874, publishing his 'Geological Survey of California' (1864-70). In 1865 he was appointed to the chair of geology at Harvard. Among his publications not already named are: 'The Metallic Wealth of the United States' (1854); 'Yosemite Guidebook' (1869); 'Contributions to American Geology' (1880); 'Studies in Geographical and Topographical Nomenclature' (1888). The highest peak of the Sierra Nevada was named Mount Whitney in his honor.

Whitney, William Collins, American capitalist and politician: b. Conway, Mass., 15 July 1841; d. New York 2 Feb. 1904. He was graduated at Yale in 1863, and at the Harvard Law School in 1865; studied law with Abraham R. Lawrence in New York, and was admitted to the bar in that city. He took an active part in the organization of the Young Men's Democratic Club, and in the proceedings against the "Tweed Ring"; served as corporation counsel of the city in 1875-82, thoroughly reorganizing the Law Department; and was secretary of the navy in the Cabinet of President Cleveland from 1885 to 1889. In this position he accomplished much in the development of plans for strengthening the naval service, and the "new navy" owes its subsequent increase in considerable part to his progressive policy. He did effective work for the election of Grover Cleveland as governor of New York in 1882, and as President in 1884, and again in 1892, when he was manager of the Democratic campaign. He, however, declined to enter the Cabinet again, preferring to pursue his business career, in which his interests had grown to great proportions. One of his largest enterprises was that which resulted in the consolidation of the various street railway lines in New York city. The Metropolitan Street Railway system was mainly organized by him, and he was a director in many corporations and societies. He was also a man of recreations, was especially interested in the breeding and training of horses, and became the recognized leader of the American turf, for the elevation of which to higher levels of sportsmanship he successfully strove. At the time of his death he was one of the largest landowners in the East, his holdings being in several States, and including a game preserve of 16,000 acres in the Adirondacks. While his main residence was in New York, he also maintained others on his various estates, North and South, as well as a house in London.

Whitney, William Dwight, American philologist, brother of J. D. Whitney (qv.): b. Northampton, Mass., 9 Feb. 1827; d. New Haven 9 June 1894. He was graduated from Williams College in 1845, studied at Yale in 1849-50, and then went to Germany, where he continued his philological and Sanskrit studies under Bopp at Berlin and Roth at Tübingen. He was appointed to the professorship of San-

skrit at Yale in 1854, and in 1870 he received in addition the chair of comparative philology, posts which he retained till his death. In 1856 he published, with Roth, an edition of the Atharva-Veda Samhita, and in 1862 issued at New Haven an edition, with translation and notes, of the 'Atharva-Veda Prātiśākhya.' His 'Language and the Study of Language' (1867) was an admirable exposition of the main principles of comparative philology. His other published works include: 'A Compendious German Grammar' (1869); 'A German Reader' (1869); an edition of the 'Taittiriya-Prātiśākhya' (1872), for which he was awarded the Bopp medal of the Berlin Academy; 'Oriental and Linguistic Studies' (1878); 'The Life and Growth of Language' (1875); 'Essentials of English Grammar' (1877); 'A Sanskrit Grammar' (1879); 'The Roots, Verb Forms, and Primary Derivatives of the Sanskrit Language' (1885), a supplement to the grammar; 'A Practical French Grammar' (1886); etc. He was a contributor to Böhtlingk and Roth's great 'Sanskrit Dictionary' (1853-75) and editor-in-chief of 'The Century Dictionary of the English Language' (1880-91). He was elected a member of the American Oriental Society in 1850 and wrote more than half of the contents of Vols. 6-12 of the 'Journal' of that society. For a complete bibliography of his work, consult the 19th volume of the 'Journal of the American Oriental Society' (1897).

Whitney, Mount, a peak of the Sierra Nevada, in the southeastern part of California; altitude, 14,522 feet. It is the highest elevation in the United States, outside of Alaska. On the east side the slope is precipitous, rising abruptly from Owens Valley about 11,000 feet. In 1881 Professor S. P. Langley remained for some time on the summit, making daily observations on the solar heat.

Whitneyite, a metallic mineral, containing 88.4 per cent of copper and 11.6 per cent of arsenic and having the formula $Cu_{10}As_2$. It is known only massive, its structure being very fine-granular. It is malleable, has a hardness of 3.5 and specific gravity of about 8.5. Its color is pale reddish-white, tarnishing quickly to a bronze or nearly black. It has been regarded as a rare mineral until the recent discovery of large quantities associated with domykite in the Mohawk mine, Michigan, where it is now a valuable ore of copper.

Whiton, hwit'ōn, James Morris, American Congregational clergyman: b. Boston, Mass., 11 April 1813. He was graduated from Yale in 1833, and in 1854-64 was rector of Hopkins Grammar School, New Haven, Conn. He was principal of Williston Seminary, East Hampton, Mass., in 1876-8, and subsequently was in charge of Congregational churches in Lynn, Mass., Newark, N. J., New York, and Haworth, N. J. Since 1896 he has been a member of the editorial staff of the 'Outlook.' He has published several volumes of sermons, text-books, an edition of selected orations from Lysias (1875), and 'Is "Eternal" Punishment Endless?' (1876); 'Gloria Patria' (1892); 'Miracles and Supernatural Religion' (1903); etc.

Whitside, hwit'sid, Samuel Marmaduke, American military officer: b. Toronto, Canada, 9 Jan. 1839. He entered the United States army

in 1858; served through the Civil War, was brevetted major in 1865 and in 1866 was appointed captain. He was afterward engaged for more than 25 years in the Indian wars on the Western frontier, where he captured Big Foot and his 400 Sioux warriors in December 1890; and commanded his regiment at the battle of Wounded Knee on the following day. He was promoted lieutenant-colonel in 1895; was in command of the 5th United States cavalry during the Spanish-American War, and was placed at the head of the Department of Santiago and Puerto Principe, Cuba, in January 1900. He was promoted brigadier-general of volunteers in 1901, receiving that rank in the regular army in 1902, and in the same year was retired from active service.

Whitsitt, hwit'sit, **William Heth**, American Baptist clergyman and educator: b. Nashville, Tenn., 25 Nov. 1841. He was graduated from Union University, Murfreesboro, Tenn., in 1861, served in the Confederate army 1862-3, and was pastor of Mill Creek church, Nashville, 1865-6. He subsequently studied at the University of Virginia, the Southern Baptist Theological Seminary, Louisville, Ky., and at Leipzig, and became pastor of a Baptist church in Albany, Ga., in 1872. He was professor in the Southern Baptist Theological Seminary 1872-95, president of that institution 1895-9, and has been professor of philosophy at Richmond College, Va., from 1901. He has published: 'History of the Origin of Infant Baptism'; 'Origin of the Disciples of Christ'; 'A Question in Baptist History' (1897).

Whitson, John Harvey, American novelist: b. Seymour, Ind., 26 Dec. 1854. He was admitted to the Indiana bar in 1876, but after practising his profession for a time turned to journalism. He has published: 'The Young Ditch Rider and Other Stories' (1899); 'Barbara, a Woman of the West' (1903); 'With Fremont the Pathfinder' (1903); 'The Rainbow Chasers' (1904); 'Justin Wingate, Ranchman' (1905).

Whitsunday, the seventh Sunday after Easter; a religious festival in commemoration of the descent of the Holy Spirit on the day of Pentecost. The name was derived from the white garments worn on that day by candidates for ordination and children presented for baptism. The older name was Pentecost. See **PENTECOST**.

Whittemore, hwit't-môr, **Amos**, American inventor: b. Cambridge, Mass., 19 April 1759; d. West Cambridge (now Arlington), Mass., April 1828. He worked for some years as a gunsmith, and finally formed a copartnership with one of his brothers and several other persons for the manufacture of cotton and wool cards. He had not been long engaged in this business before he invented a machine for puncturing the leather and setting the wires, a work previously performed by hand. In experimenting for this invention he met with great difficulty in bending the wires to a given angle after they were finally fastened in the leather, and was on the point of giving up the attempt when in a dream he discovered a method of effecting it. The invention was patented in the United States in 1797, and Whittemore went to England to secure his rights there, but was unsuccessful.

In the United States the patent was sold for \$150,000; but afterward his brother Samuel Whittemore repurchased it, and carried on the business. Amos Whittemore devoted his last years to the invention of an orrery, in which every planet was to describe its own orbit, but did not live to complete it.

Whittemore, Thomas, American Universalist clergyman: b. Boston 1 Jan. 1800; d. Cambridge, Mass., 21 March 1861. He studied for the ministry under the Rev. Hosea Ballou, in April 1821; was settled as the Universalist minister at Milford, Mass., and the next year removed to a church in Cambridgeport, Mass. He resigned in 1833 but resided in Cambridge for the remainder of his life. Early in his ministry he was joint editor of the 'Universalist Magazine,' and in 1828 commenced the publication of the 'Trumpet,' a Universalist newspaper in Boston, of which he was sole editor and proprietor for nearly 30 years. He was also president of the Cambridge bank and of the Vermont and Massachusetts railroad, and represented Cambridge repeatedly in the State legislature. He published: 'A History of Universalism' (1830, enlarged 1860); 'Notes and Illustrations of the Parables' (1832); 'Songs of Zion' (1836); 'Plain Guide to Universalism' (1839); 'Life of Hosea Ballou' (1854-5); etc. Consult his 'Autobiography' (1859).

Whittier, hwit't-ër, **John Greenleaf**, American poet: b. Haverhill, Mass., 17 Dec. 1807; d. Hampton Falls, N. H., 7 Sept. 1892. A Quaker, he labored in boyhood on the farm made celebrated by 'Snowbound,' and received but little formal education, though he contrived by working at shoemaking and teaching to pay for two periods of six months at Haverhill Academy in 1827-8. The acceptance of a poem from him in 1826 for the Newburyport 'Free Press' led to a lifelong friendship with its editor, William Lloyd Garrison (q.v.). He edited the 'American Manufacturer,' a weekly concerned chiefly with mechanics, the industries, and agriculture, in Boston in 1829, and in the following year the 'Haverhill Gazette.' During 1830-2 he conducted the 'New England Review,' which G. D. Prentice (q.v.) had brought into some prominence, at Hartford, Conn., and to this time belong his first independent publications, 'Legends of New England' (1831), and 'Moll Pitcher' (1832). In 1833 he issued 'Justice and Expediency,' an anti-slavery pamphlet and acted as a secretary of the anti-slavery convention at Philadelphia, and a member of the committee which drafted the 'declaration of principles.' He sat in the Massachusetts legislature in 1835, and in the following year sold his farm and removed to Amesbury, some eight miles northeast of Haverhill, where he chiefly resided for the rest of his life. In 1836 he became a secretary of the Anti-Slavery Society, and in 1837 there appeared a volume of 'Poems Written During the Progress of the Abolition Cause in the United States.' With that cause he was now thoroughly identified. At Concord, N. H., he was mobbed with George Thompson (q.v.), during the latter's lecturing tour. Whittier edited the 'Pennsylvania Freeman' in Philadelphia during 1838-40, and in the first of these years his office was sacked and burned by a mob. In 1844-5 he edited the 'Middlesex Standard' in Lowell, and during

WHITTINGHAM—WHITTINGTON

1847-60 was corresponding editor of the 'National Era,' a Washington paper, sometimes writing half-a-dozen columns weekly of general articles and reviews. He also contributed to the 'Atlantic Monthly' from its foundation in 1857. His poem, 'A Word for the Hour' (January 1861), shows that he shrank from the Civil War and was prepared to let the Southern States secede. He hailed the end of the war and of slavery with delight, and did his utmost to induce the North to welcome back the South in the most generous spirit. His publications, after those above mentioned, include the following: 'Mogg Megone' (1836); 'Poems' (1838); 'Lays of My Home, and Other Poems' (1843); 'The Stranger in Lowell' (1845); 'Supernaturalism in New England' (1847); 'Leaves from Margaret Smith's Journal' (1849), an imaginative description of early New England, and 'Old Portraits and Modern Sketches' (1850), all four collected from the 'Era'; 'Voices of Freedom' (1846); 'Songs of Labor, and Other Poems' (1850); 'The Chapel of the Hermits, and Other Poems' (1853); 'Literary Recreations and Miscellanies,' also gathered from the 'Era' (1854); 'The Panorama, and Other Poems' (1856); 'Home Ballads and Poems' (1860); 'In War Time, and Other Poems' (1864); 'National Lyrics' (1865); 'Snowbound: a Winter Idyl' (1866); 'The Tent on the Beach, and Other Poems' (1867); 'Among the Hills, and Other Poems' (1869); 'Miriam, and Other Poems' (1871); 'The Pennsylvania Pilgrim, and Other Poems' (1872); 'Hazel Blossoms' (1875); 'Mabel Martin: a Harvest Idyl' (1875); 'The Vision of Echard, and Other Poems' (1878); 'The King's Misave, and Other Poems' (1881); 'The Bay of Seven Islands, and Other Poems' (1883); 'St. Gregory's Guest, and Recent Poems' (1886); and 'At Sundown' (1892), a posthumous volume. The Riverside edition of his works, both in prose and in verse, carefully revised and annotated by himself, appeared at Boston in 1888-9. The most complete edition of the poems is the one-volume Cambridge edition (1895). Whittier was long interested in politics, though his active part in it largely ceased with the development of anti-slavery opinion in the North. His services to the cause of anti-slavery were important. He wrote numerous occasional poems celebrating or denouncing incidents and events of the conflict, the best-known being the 'Ichabod' verses, "the most powerful that he ever wrote," rebuking the defection of Webster from the anti-slavery principles in the 'Seventh of March' speech. Opposed to the Civil War, he insisted, when it was begun, that slavery was the vital question; and during its progress contributed largely to the small quantity of valuable poetry that it evoked. Subsequently he devoted himself to presenting in narrative and ballad poems the legends, traditions, and history of colonial America, particularly New England; to describing, as he did notably in 'Snow-Bound,' rural scenes and conditions, the latter of which have passed into history; and to writing several hymns which appear in the collections of many denominations. His work had been criticised for its inequality and faulty rimes, and also somewhat for its moralizing tendency. Much of his verse does reveal a certain want of com-

pression and verbal selection, due principally to the fact that it was written with a readiness approaching improvisation. To object to his moralizing tendency is simply to object to the point of view of one who was originally and strongly a reformer. His leading characteristics are a fine simplicity, a convincing quality, and what Lowell styled as his "genial piety." He was less cosmopolitan than Longfellow, but by many critics has been ranked as not greatly inferior to that poet. Consult the biographies by Underwood (1875; new ed. 1883); Kennedy (1882); Linton (1893); Pickard (1894; the authoritative 'Life and Letters'); Barton (1900; 'Beacon Biographies'); and Carpenter (1903; 'American Men of Letters'). Also Fields, 'Whittier. Notes of His Life and His Friendships' (1893); Claffin, 'Personal Recollections of John G. Whittier' (1893); Pickard, 'Whittier as a Politician' (1900) and 'Whittier Land' (1904); and Stedman, 'Poets of America' (1886).

Whittingham, hwit'ing-ham, William Robinson, American Protestant bishop: b. New York 2 Dec. 1805; d. Boston 17 Oct. 1879. He was graduated at the General Theological Seminary, New York, in 1825, ordained deacon in 1827, and priest 1829, and was in charge of St. Mark's Church, Orange, N. J., until 1831. He then became rector of St. Luke's, New York, and in 1835 he became professor of ecclesiastical history in the General Seminary, which position he held until his consecration as bishop of Maryland in 1840. In this office he commanded universal respect by the fullness and breadth of his scholarly attainments. He was generally recognized, especially in the historical field, as the most learned prelate in his communion. A convinced but fair and chivalrous controversialist, he advocated the principles of his faith in such a way as to win adherence to them in all parts of the country. The written evidence of his learning is, however, preserved principally in the pages of various periodical publications, such as 'The Churchman,' of which one time he was editor. During the Civil War, in opposition to many of the people in Maryland, he was unflinching in his advocacy of loyalty to the Federal government.

Whittington, hwit'ing-tôn, Richard, English magistrate: b. Pauntley, Gloucestershire, about 1359; d. London March 1423. He became a mercer in London, a member of the common council in 1385 and 1387, subsequently alderman and sheriff, and mayor in 1397-8, 1406-7, and 1419-20. He was very liberal in charitable gifts. The legend which represents him as making his fortune by sending a cat in an outgoing ship to Barbary, where it was sold for a large sum, and as returning to London, which he had just quitted, on hearing Bow bells sounding what seemed to be

Turn again, Whittington,
Lord Mayor of London,

is without foundation; though it is treated as fact in the uncritical 'Lives' by Lysons (1860) and Besant and Rice (1881; 2d ed. 1894). Consult Clonston, 'Popular Tales and Fictions' (1887) and Wheatley's edition (for the Villon Society) of the 'History of Sir Richard Whittington' by T. H. (1885).

WHITTLESBY — WHYDAH-BIRD

Whittlesby, hwit'l-sī, Charles, American geologist: b. Southington, Conn., 4 Oct. 1808; d. Cleveland, Ohio, 1886. He was graduated from West Point in 1831, served in the Black Hawk war of 1832 and resigned from the army in that year. He was admitted to the bar and engaged in law practice at Cleveland, where he was on the editorial staff of the 'Herald' in 1836-7, and in 1837-8 was engaged in the Ohio State geological survey. He was occupied in making a mineralogical and geological survey of the Lake Superior and upper Mississippi regions for the United States government in 1847-51, and in 1858-60 was attached to the Wisconsin geological survey. On 17 April 1861 he was appointed assistant quartermaster-general on the staff of the governor of Ohio, and in the western Virginia campaign served as chief engineer of the Ohio troops. He was appointed colonel in August 1861 and was subsequently chief engineer of the Department of the Ohio. He led his regiment at the battle of Fort Donelson and at the battle of Shiloh was in command of a division. Failing health compelled his resignation in 1862 and he resumed his surveys in the Lake Superior and upper Mississippi regions. He was one of the founders in 1867 of the Western Reserve Historical Society of Cleveland, and was for many years its president. His writings include more than 200 titles. Among them are: 'Description of Ancient Works in Ohio' (1851); 'Ancient Mining on the Shores of Lake Superior' (1863); 'Early History of Cleveland and Vicinity' (1867); etc.

Whittrodge, hwit'rēj, Worthington, American artist: b. Springfield, Ohio, 23 May 1820. He studied art in Cincinnati, worked there as a portrait-painter 1842-9, later went to Europe, and studied under Andreas Achenbach at Düsseldorf, also in Paris, Belgium, Holland, and Rome, returning to the United States in 1859, to become noted as a landscape painter, his chief subjects being drawn from American scenery. Accompanying Gen. Pope on a tour of inspection at the West in 1874, he sketched many Rocky Mountain views. He was president of the National Academy of Design in 1875-6. His chief works include: 'House on the Hudson River' (1863); 'Old Hunting Ground' (1864); 'View of the Rocky Mountains from the River Platte' (1868); 'Trout Brook' (1875); etc.

Whitworth, hwit'wérth, Sir Joseph, English mechanical engineer: b. Stockport 21 Dec. 1803; d. Monte Carlo, Italy, 22 Jan. 1887. He worked as a mechanic in Manchester and London, discovered the method of making a truly plane surface, and in 1833 established himself as a tool-maker at Manchester. Between 1840 and 1850 he developed his measuring-machine, by means of which he elaborated his standard system of measures and gauges which was found by engineers to be of great usefulness. One of his devices which proved to be of much immediate service was that of a uniform system of screw-threads. He made many experiments in connection with rifles, and in 1857 perfected a hexagonal-barreled rifle of great range, accuracy, and penetrative power, highly excelling the Enfield, then largely in use. It was not accepted at the time by the War Department, as being of a calibre too small (.45) for a military weapon: though in 1869 the War Of-

fice declared that a weapon of such calibre would appear to be the most suitable. He was equally successful in the building of cannon, but his rifled gun with a 250-pound shell and a six-mile range, was rejected by the ordnance board in 1865, greatly to the detriment of British ordnance. His invention of compressed cast steel for ordnance was an important one, and came into general use. His works at Manchester were converted into a limited liability company in 1874, and in 1897 united with the Elswick works, established by Sir William Armstrong (q.v.). His fortune was devoted to the endowment of 30 scholarships in mechanics, and to the furthering of charitable and educational work. He was made a baronet in 1869. Among his writings were: 'The Industry of the United States in Machinery, Manufactures, and Useful and Ornamental Arts' (1854) and 'Miscellaneous Papers on Mechanical Subjects' (1858). Consult the memoir in the 'Proceedings' of the Institution of Civil Engineers, Vol. XCI. (1887-8). See ORDNANCE.

Whitworth Gun. See ORDNANCE.

Whitworth Scholarships, a name given certain scholarships established in England in 1869 by Sir Joseph Whitworth, to encourage the cultivation of combined theoretical and practical skill in the industrial arts of mechanics and engineering. They were placed by the founder under the charge of the English council of education, and are open to be competed for by any young man not 26 years complete, and who has been engaged in handicraft in the workshop of a mechanical engineer for at least three years. There are now four scholarships annually competed for of the value of \$500, tenable for three years, besides exhibitions tenable for one year, value \$250 and \$400.

Whooper, the whooping swan. See SWAN.

Whooping-cough. See HOOPING-COUGH.

Whooping Crane. See CRANE.

Whortle-berry. See VACCINIACEÆ.

Whydah, hwid'ā, French West Africa, a seaport town of Dahomey, on a lagoon communicating with the Bight of Benin, about 70 miles south of Abomey. It has a considerable trade in palm-oil. Pop. est. 15,000.

Whydah-bird, or **Widow-bird**, a weaver-bird (q.v.) of the West African subfamily *Vidua*, in which the tail-feathers are greatly prolonged and modified. The paradise whydah-bird is brownish-black, the head, chin, and throat being black, and the neck encircled by a brown collar. The under parts are pale brown. The tail is long and the two central feathers are elongated and possess broad webs at the tip and a slender shaft, while the two next feathers are about 11 inches long and are broadly webbed. The other tail feathers are set vertically. This species attains a length of five or six inches, exclusive of the tail feathers. The nest is said to be ingeniously made of cotton fibres, and to be divided into two compartments, in one of which the female sits on the eggs, the other being occupied by the male bird. The shaft-tailed whydah-bird (*V. regia*) is colored a rusty red on the head and neck, the back of the head and crown being black. The average length of this species is eight or nine inches; and the four central feathers are elongated, but consist each of the bare shaft

WHYMPER—WICHITA

or quill only, a slight web existing at their tips. Consult Newton, 'Dictionary of Birds' (New York, 1896).

Whympér, hwím'pér, Edward, English author and traveler: b. London 27 April 1840. He was educated privately, and in 1860 was sent by a London firm to make sketches of Alpine peaks. He ascended Mount Pelvoux in the French Alps in 1861, the Pointe des Ecrins in 1864, and in 1865 the Matterhorn. He visited northern Greenland in 1867 and in 1872, making valuable discoveries in evidences of a previous abundant, rich vegetation there, his collection of specimens being now a part of the collection of the British Museum. In 1879-80 he explored the Andes in Ecuador, discovered the Andean glaciers, and succeeded in ascending Chimborazo, a feat which Humboldt attempted and had failed to accomplish. In 1901 he made an exploring tour of Canada, ascending mountains and making investigations in the region of the "Great Divide." His publications include: 'Scrambles Among the Alps in the Years 1860-9' (1871); 'Travels Among the Great Andes in the Equator' (1892); 'Zermatt and the Matterhorn' (1897); etc.

Whyte-Melville, hwít'mél'vél, George John, British novelist: b. Fifeshire, Scotland, 19 June 1821; d. Vale of Aylesbury, Berkshire, 5 Dec. 1878. He was educated at Eton and at 18 joined the 93d Highlanders, from which he exchanged in 1846 into the Coldstream Guards. He retired in 1849 with the rank of major, but volunteered for active service in the Crimean war and was appointed major of the Turkish irregular cavalry. The rest of his life was chiefly devoted to fox-hunting and other field sports, and to the writing of novels of fashionable and sporting life. He was killed by the fall of his horse while hunting. The following are among his novels: 'Kate Coventry' (1856); 'Holmby House' (1860); 'The Queen's Maries' (1862); 'Bones and I' (1868); 'Contraband' (1870); 'Sarchedon' (1871); 'Satanella' (1873); 'Rosine' (1875); 'Roy's Wife' (1878); 'Black but Comely' (1879). He also published some volumes of verse.

Wiard, Norman, American inventor: b. Normandale, Ont., 1826; d. Reading, Pa., 11 Sept. 1896. In early life he was foreman in a foundry at Bradford, Ont., where he began experiments in founding ordnance. During the Civil War he was employed by the United States government in the manufacture of ordnance and projectiles, and was frequently called into consultation by the President and Secretary Stanton. After the war he applied himself to experiments and inventions in his special lines; patented a device for preventing the explosion of steam-boilers, which he sold to the United States and Japanese governments; spent two years in Japan in government employ; was for some time a military engineer in that country; and on his return to the United States conducted, near Boston, a series of experiments in gunnery which attracted wide attention.

Wiborg, ví'börg, or Viborg, Russia, (1) A town in Finland, capital of the government of its own name, on a bay in the Gulf of Finland, 72 miles northwest of Saint Petersburg, with which and with Helsingfors it is connected by railway. It is regularly built in spacious streets;

and has the ruins of a fine old castle, situated on an isolated rock in an arm of the sea. It carries on some iron-founding and other industries, and has a considerable trade in timber, deals, tar, tallow, and fish. The canal that connects the Gulf of Finland with Lake Saima starts at Wiborg. Pop. about 35,000. (2) The government forming the southeastern region of Finland, has an area of 13,530 square miles. Pop. about 400,000.

Wicas'set, Maine, town, port of entry, county-seat of Lincoln County; on the Sheepscot River, and on the Maine Central Railroad; about 48 miles northeast of Portland and 20 miles from the Atlantic. In 1760 the town was incorporated under the name of Pownalboro, and in 1802 it was reincorporated under the present name. Wicasset is a popular summer resort. It is in an agricultural region and has some manufacturing interests. It has two banks. Pop. (1910) 1,287.

Wichern, ví'čérn, Johann Heinrich, German philanthropist: b. Hamburg 21 April 1808; d. there 7 April 1881. He studied theology at Göttingen and Berlin, and then returning to his native town gave himself up to endeavors to improve the condition of the poor and suffering. In the Rauhes Haus (founded 1 Nov. 1833) he established an institution for neglected children, with a training seminary for teachers connected with it, and similar institutions were shortly afterward formed throughout Germany. In 1856 he was appointed councillor of the Prussian ministry of the interior, and in 1858 superintendent of all penal and reformatory institutions in the kingdom. His writings include: 'Die Innere Mission der Deutschen Evangelischen Kirche' (1849); 'Die Behandlung der Verbrecher und Entlassenen Sträflinge' (1853); 'Der Dienst der Frauen in der Kirche' (1858). Consult Lives by Oldenburg (1881-6); Krummacher (1882).

Wichita, wích'í-tá, Kan., city, county-seat of Sedgwick County; on the Arkansas River, and on the Missouri P., the Atchison, T. & S. F., the Wichita & C., the Wichita & W., the Chicago, R. I. & P., and the St. Louis & San Francisco R.R.'s; about 230 miles southwest of Kansas City. It is in a fertile agricultural region, and is the commercial and industrial centre of southern Kansas. The chief products of this section are wheat, corn, hogs, and cattle. The city is on a rolling prairie; it has broad, well-shaded streets, and a good system of water-works and sewerage. The principal parks are Linwood, Riverside, and Griswold.

Business Interest.—In 1909 (Government census) the city had 225 manufacturing establishments, capitalized for \$9,849,000, and employing 718 persons, to whom were paid annually in salaries and wages \$2,211,000. The raw material used each year cost \$16,985,000, and the value of the finished products was \$22,564,000. The chief manufactures were 7 confectionery, whose products brought annually \$171,613; 10 flour and grist mills, annual products \$457,275; 11 saddlery and harness works, products \$168,565; and 18 men's clothing establishments, products \$102,452. The estimated number of employees in manufactories in 1904 was 4,000. Other manufactures were foundry and machine-shop products, furniture, lumber products, brick, tile, books and papers, tobacco products, brooms,

WICHITA FALLS—WICLIFF

brushes, and wood and paper boxes. The city has large meat-packing houses, and a number of wholesale and jobbing houses.

Public Buildings, Churches, and Schools.—The principal buildings are the Government building, the county court-house, city-hall, three commercial blocks, opera houses, and hotels. The Scottish Rite Masonic Cathedral is a noteworthy building. There are 37 churches, representing 18 different denominations. It is the episcopal see of a Roman Catholic bishop. There are a city hospital, Saint Francis Hospital, Saint Joseph's Orphan Asylum, The Martha Washington Home, Children's Home, and a city orphanage. The educational institutions are the Friends' University (1898), Fairmount College (Cong.), opened in 1892; the Albert Magnus College (R. C.), opened in 1900; Kansas College of Osteopathy, All Hallows Academy (R. C.), Lewis Academy (Presb.), Wichita Business College, Wichita Commercial College, a public high school, opened in 1877, public and parish schools, and a public library which contains about 8,000 volumes.

Banks.—There are eight banks, four national, three state, and one private. They have a combined capital of \$500,000 and deposits amounting to about \$4,500,000.

Government.—The government was administered under a charter of 1886, which provided for a mayor, who held office two years, and a city council of 12 members from six wards. The government is conducted on the commission plan.

History.—Wichita was settled in 1869 by Indian traders. In 1870 it was incorporated, and in 1872 was chartered as a city of the second class. Pop. (1900) 24,671; (1910) 32,450, an increase of 112.6 per cent.

M. M. Mumock,

Editor of 'Wichita Daily Eagle.'

Wichita Falls, Texas, county-seat of Wichita County; on the Wichita River, and on the Wichita Valley railroad; about 115 miles northwest of Fort Worth. It is in an agricultural and stock-raising region. It has two national banks with a combined capital of \$150,000 and deposits (1903) amounting to \$385,000. Pop. (1910) 8,200.

Wichita Indians. One of the southern tribes of the Caddoan linguistic stock of North American Indians whose traditional home was the Wichita Mountains of Oklahoma, near which their reservation now lies. In the first half of the 19th century their principal village was on the north fork of Red River, a short distance below the mouth of Elm Creek, in Oklahoma, but three centuries ago (in 1541) Coronado found them in Kansas, between the Arkansas and Kansas rivers, in what the Spaniards designated the province of Quivira (q.v.). The typical house of the Wichitas is the grass lodge; they were always agriculturists, and formerly practised tattooing, from which custom and from their resemblance to their congeners, the Pawnees, they were called by the French *Pani Piqués*. They are now under the Kiowa agency in Oklahoma, where, with their subtribes, the Tawakoni and Waco, they number more than 300.

Wicklow, wík'lô, Ireland, a maritime county of Leinster Province, on the Irish Sea, with an area of 782 square miles. Chief town, Wicklow. The county generally is mountain-

ous, but has fertile lowlands where oats and potatoes are cultivated, and much pasture land devoted to stock-raising. Copper, lead, and iron are mined.

Wicksteed, Philip Henry, English Unitarian clergyman and Dante scholar: b. Leeds, Yorkshire, 25 Oct. 1844. He was educated at University College, entered the Unitarian ministry in 1867, and was minister of Little Portland Street Chapel, London, 1874-97. Since 1887 he has been prominent as a university extension lecturer, especially on Dante, Ibsen, and economics. He has published: 'Dante: Six Sermons' (1880); 'Alphabet of Economic Science' (1888); 'Henrik Ibsen' (1892); and the translation and notes of the Temple edition of Dante's 'Paradiso.'

Wiclif, wík'lif (Wicliffe, Wiclef, Wicliff, or Wychliff), John, English reformer: b. Spreswell, Yorkshire, probably about 1330; d. Lutterworth 31 Dec. 1384. He studied at Balliol College, Oxford, of which he became master at some date between 1356 and 1361, in which latter year he was appointed by his college to the living of Fillingham, in Lincolnshire. About the same time the pope bestowed upon him a prebend in the collegiate church of Westbury-on-Trym, near Bristol, in which he was confirmed by the king. In 1368 he gave up Fillingham and accepted the living of Ludgershall, in Buckinghamshire, and four years later qualified as doctor of theology. He was presented by the crown in 1374 to the benefice of Lutterworth, in the south of Leicestershire, which he held till his death. A Latin tract 'Determinatio quaedam Magistri Johannis Wycliff de Dominio contra unum Monachum,' has been regarded as belonging to the controversy raised by the refusal of the parliament of 1366 to pay a tribute demanded by the Pope Urban V., in virtue of the homage paid by King John to Innocent III., but some authorities refer it to a date about ten years later, when similar circumstances arose. At the time of writing the tract Wiclif was a kind of royal chaplain, for he calls himself *peculiaris regis clericus*, and in 1374 was named second on a commission which went to Bruges to try to settle disputes concerning ecclesiastical jurisdiction with the representatives of the Pope Gregory XI. He had shortly before been appointed a canon of Lincoln, but never actually obtained a prebend in that cathedral. The development of his views on the relation between the ecclesiastical hierarchy and the secular authorities brought him into close association with John of Gaunt, duke of Lancaster, and his party, and in 1377 the anti-Lancastrians sought to strike at their political opponents through Wiclif. He was summoned in that year before Archbishop Sudbury and his suffragans at St. Paul's, and attended, accompanied by Lancaster, Lord Percy, and other powerful Lancastrians. A violent altercation between the duke and William Courtenay, bishop of London, caused the break-up of the meeting, and the infuriated populace plundered Gaunt's palace and attacked Percy's house. Soon afterwards Pope Gregory sent several bulls to the University of Oxford, the Archbishop of Canterbury, and the bishop of London, in which he accused Wiclif of teaching the condemned doctrines of Marsilius of Padua and John of Jandun, and ordered him to be arrested and exam-

ined. The parties were reluctant to move in view of Wiclif's great popularity and influence, and even after the bulls had arrived he was consulted by the government as to whether they might legally prevent money from going abroad to absentee holders of benefices. He eventually appeared before the prelates at Lambeth in 1378, but the king's mother sent a message forbidding them to interfere with him, and a popular demonstration in his favor put an end to the proceedings. In the Gloucester parliament of 1378 he made a defence of John of Gaunt, who had grossly violated the Westminster right of sanctuary.

This year, 1378, was an important date in Wiclif's religious career. While continuing to inveigh against certain abuses, he now began to question the whole basis of sacerdotalism and its authority, and by 1381 had attained to a substantially Lutheran position in regard to transubstantiation and the mass. About this time also he began to make his appeal to the common people and to present religion as a popular force rather than a dogmatic system or an organized institution. This appeal assumed two forms, the sending out of his "poor preachers" and the translation of the Bible from the Vulgate into the English of his day. His itinerant evangelists spread his doctrines throughout the land and soon made the Lollard movement one of great strength and importance. In his translation of the Bible he had the assistance of Nicholas Hereford, who was responsible for most of the Old Testament, and the whole work was revised by his assistant at Lutterworth, John Purvey, who finished it soon after Wiclif's death. Wiclif's views on the eucharist were promptly condemned at Oxford and forbidden to be taught there, and in 1382 Courtenay, archbishop of Canterbury, summoned a council in the Blackfriars' convent hall, at which Wiclif's teaching was condemned and some of his followers excommunicated. This council, known as the "earthquake council" because a violent earthquake occurred during the meeting, ordered the Carmelite Dr. Stokes to publish the condemnation at Oxford. The chancellor of Oxford University at that time, Robert Rygge, was a supporter of Wiclif and evaded the duty of carrying out the council's mandate until absolutely compelled to do so. Wiclif himself remained untouched, but he retired to Lutterworth, where he occupied himself in preaching and writing. It is said that Urban VI. summoned him to Rome in 1384, but this is doubtful. He had a paralytic stroke in 1382 or 1383, and again in 1384, from which he died. He was buried at Lutterworth, but in 1428, in accordance with a decree of the council of Constance in 1415, his body was exhumed and burned, and his ashes thrown into the river Swift.

Of the 24 Wiclifite propositions condemned by the earthquake council ten were described as heretical and 14 as erroneous. The most important of the ten were: that transubstantiation is philosophically false, since the substance cannot be changed while the accidents remain; that transubstantiation is not taught in the Gospels; that confession is not necessary to salvation; that no one after Urban VI. should be recognized as pope; and that it is unscriptural for ecclesiastics to hold temporal possessions. Of the erroneous doctrines, several seriously limited the right of excommunication in a distinctly

Protestant sense, one asserted the right of unlicensed preaching, another declared that dominion, whether civil or ecclesiastical, could not belong to one in mortal sin, and another distinctly asserted the authority of the temporal power over the ecclesiastical in temporal affairs. Wiclif unmistakably made his appeal to Scripture as of higher authority than Church tradition or decrees, and had a strong sense of the individualistic basis of religion. He never reached the Lutheran doctrine of justification by faith, but from denunciation of abuses in the Church rapidly advanced to his three main positions: that all dominion was of divine origin and was forfeited by anyone in mortal sin; that transubstantiation was a doctrine both unphilosophical and unscriptural; and that monasticism in every form was a corrupt institution.

At first he attacked only the luxurious and corrupt orders of monks and was on friendly terms with the friars, but from about 1379 the friars were also included in his condemnation. He was one of the last of the realists in philosophy, and he tried to reconcile predestination with the freedom of the human will. Not only was Wiclif one of the chief forerunners of the Reformation, but he was also a pioneer in English prose literature. He wrote many learned works in Latin, but the nature of his message and the necessities of his position led him to appeal to the people in works in their own tongue. His chief Latin works are: 'De Dominio Divino'; 'De Dominio Civili'; 'De Officio Pastoralis'; and 'Trialogus.' All, except the 'Trialogus' and the 'De Officio Pastoralis,' and also volumes of Latin sermons and a volume of Polemical Works, have been edited by English and foreign scholars for the Wiclif Society. The excepted works were edited by Lechler (1869 and 1863 respectively). His translation of the Bible was edited by Forshall and Madden (1850); and his English works are to be found in the three collections: 'Three Treatises of John Wycliffe' (1851), by Todd; 'Select English Works of Wycliffe' (1869-71), by T. Arnold; and 'The English Works of Wycliffe' hitherto unprinted (1880, Early English Text Society), by F. D. Matthew.

Consult: 'Wicliffe' in the Dictionary of National Biography; Lechler, 'Johann von Wicliffe und die Vorgeschichte der Reformation' (1873); Poole, 'Wycliffe and Movements for Reform' (1889), and 'History of Mediæval Thought' (1884); Burrows, 'Wicliffe's Place in History' (1881); Buddensieg, 'Johann Wicliffe und seine Zeit' (1885); Jos. Stevenson, 'The Truth About John Wicliffe'; Parson, 'Studies in Church History' (Vol. 2); F. A. Gasquet, 'The Eve of the Reformation.'

Widdin, vid'In, or Vidin, Bulgaria, a town on the right bank of the Danube, near the Servian frontier, consisting of three parts, the town on the Danube, the walled city, and the citadel. The principal buildings are the palace, several mosques with lofty minarets, and a range of bazaars lining the main street. Ships can reach the town at high-water. There is a considerable trade, chiefly in corn, wine, and salt, and the chief manufacturers are gold and silver filigree work and jewelry. Widdin was formerly strongly fortified and during Russo-Turkish wars was important strategically, but the treaty of Berlin (1878), which erected Bul-

WIDE AWAKES—WIDOW

garia into a hereditary principality tributary to the Porte, decreed that its fortifications should be dismantled.

Wide Awakes, in American political history, a name adopted by numerous Republican campaign clubs organized for the purpose of aiding in the election of Abraham Lincoln during the presidential campaign of 1860. The first club was organized in Hartford, Conn. It is stated that in New York city there were on one occasion 20,000 Wide Awakes marching in procession.

Wide, Wide World, The, a tale by Susan Warner, published in 1851 under the pen name of "Elizabeth Wetherell." It reached a sale of over 300,000 copies. The life of the heroine, Ellen Montgomery, is followed from early childhood to her marriage with a fulness of particulars which leaves nothing to the reader's imagination. The scenes and episodes are those of a homely every-day existence, described with a close fidelity to detail. Ellen's spiritual experience is minutely unfolded, and the book was long regarded as one of those which are "good for the young." The criticism of a later generation, however, pronounces it mawkish in sentiment and unreal in conduct. It stands among the fading fancies of an earlier and less exacting literary taste.

Wide'ner, Peter A. Brown, American capitalist: b. Philadelphia, Pa., 13 Nov. 1834. He acquired a large fortune in the meat business, entered politics, was appointed city treasurer of Philadelphia in 1873 and in 1874 was re-elected to that office. He is largely interested in street railway corporations. In 1897 he presented to the city of Philadelphia his private residence, valued at \$600,000, for a branch of the Free Lending Library, and in the following year gave to the library a collection of 500 rare books valued at \$25,000. In 1899 he endowed at Philadelphia the Widener Memorial Training School for Crippled Children, a combined home, hospital, and school. The school site consists of a tract of 36 acres at Logan, a Philadelphia suburb.

Widgeon, or **Wigeon**, a river-duck of the genus *Mareca*. Widgeons have a short bill, much rounded at the tip, with a strong, broad nail, and the upper lamellae prominent; wings long and pointed; tail moderate and wedge-shaped. There are about 10 species in various parts of the world. They are found on the seashore and on the margins of lakes and rivers, feeding chiefly on vegetable substances, and performing periodical migrations at night in vast flocks. The American widgeon or baldpate (*M. americana*) is about 20 inches long and 35 in alar extent; the bill is blue, black at the base and tip; upper parts finely waved transversely with dark lines; lower parts mostly white; top of head nearly white, with a broad green patch around and behind the eyes; rest of head and neck grayish, spotted and banded with black; wing-coverts white, the greater tipped with black; speculum green, encircled by black. The baldpate is found throughout North America, breeding chiefly north of the United States and wintering in Central America. It is an active bird, with a swift and well sustained flight, in ranks of various and irregular forms; and it associates during the winter with teal and other ducks. The flesh is highly esteemed,

especially when they have fed in the rice fields of the south, or along with the canvas-back on the water-celery of the Chesapeake. They do not dive, but feed with the head and neck immersed, swimming very near together. The food consists of aquatic seeds, roots, insects, worms, small fry, leeches, nuts, and grain, especially rice in the rainy season; being very fond of the tender aquatic plants on which the canvas-back feeds, and no diver itself, it watches the latter and snatches the morsels as it emerges and before it has had time to open its eyes. They are among the most difficult ducks to shoot, owing to their shyness and swift, irregular flight. The nest is built on the ground, often far from water, and usually of leaves lined with down. The eggs number 8 or 10, are pure ivory white, and about 2 inches long by nearly 1½ in diameter. The European widgeon (*M. penelope*) is rather smaller, and not uncommon all along the Atlantic coast of the United States, as well as on the Pacific. It differs chiefly in having the head and neck reddish brown or cinnamon, the top of the head cream-colored. Consult Grinnell, 'American Duck Shooting' (New York, 1902).

Widmann, vid'n-män, Max, German sculptor: b. Eichstätt, Bavaria, 13 Oct. 1812; d. Munich, Bavaria, 3 March 1895. He was educated at Munich and at Rome, executing while at the latter city his "Shield of Hercules," considered one of his masterpieces, and in 1849 became professor of sculpture at the academy of Art at Munich. Several of the public monuments in that city are by him, but his best work is considered to be shown in his busts and statuettes, which, however, are fewer in number. His statues include those of Orlando de Lasso (1848); Schiller (1863); Goethe (1868); Castor and Pollux (1877). Specimens of his workmanship are to be found at Bamberg, Ratisbon, Würzburg, and other cities.

Wid'nes, England, a manufacturing town in Lancashire, on the Mersey, opposite Runcorn, 13 miles east-southeast of Liverpool by rail. There are extensive chemical, alkali, and soda works; soap, candle, grease, and manure works; copper-smelting works and rolling-mills, and iron-foundries. The town has a considerable carrying trade, which has been further developed by the construction of large docks in 1866, extended in 1884.

Widow, a married woman who becomes bereft of her husband; a grass-widow is a divorced woman. In 1900 there were 2,720,000 widows in the United States, of which 320,000 were in New York State, 120,000 in Massachusetts and 88,000 in Indiana. There were but 8,000 in Utah. New York city contains 105,000 widows and Chicago but 23,097. Among the ancients was practised a form of funeral sacrifice, in which the widow was slain or induced to commit suicide so that she might be buried with her husband and accompany him to the world of spirits. This practice is mentioned as existing among the Greeks by Euripides and Pausanias, and from Caesar it may be inferred that it existed also in Gaul. Widow sacrifice is still the custom in many African tribes; traces of it may be found in China; it lingered till late in the first half of the 19th century in Fiji, and though abolished by law in British India in 1829, is not yet abandoned.

WIDOW BEDOTT PAPERS — WIESSADEN

Widow Bedott (bē-dōt') **Papers**, The, a collection of broadly humorous sketches by Frances Miriam Whitcher, which appeared first in Neal's 'Saturday Gazette' of Philadelphia, about 1847, and in book form in 1855. They were extremely popular in their day and are still read and quoted from, though they have been followed by many works in a similar vein, such as Marietta Holley's 'My Opinions and Betsey Bobbett's' (1873), to mention one of the best known.

Widow Bird. See WHYDAH-BIRD.

Wieland, vē'lānt, Christoph Martin, German author. b. Oberholzhelm, near Biberach, 5 Sept. 1733, d. Weimar 20 Jan. 1813. Having received a thorough preparation, he went in 1750 to the University of Tübingen to study law, but most of his time was devoted to belles-lettres. In 1751 appeared his 'Zwölf Moralische Briefe,' which met with very favorable reception. He also wrote at this time the didactic poem, 'Anti Ovid.' In 1752 he went to Zurich as a literary companion to J. J. Bodmer (q.v.). He was inspired by the deeds of Frederick the Great to write a poem exhibiting the ideal of a hero, for which purpose he chose the story of Cyrus. The first five cantos appeared in 1759, but the poem remained unfinished. About this time he published 'Araspe and Panthea,' an episode from the 'Cyropaedia' of Xenophon. In 1754 he left Bodmer's house, became a tutor, and in 1760 returned to Biberach, where he translated 28 of Shakespeare's plays (1762-8). In 1762 he went to live with Count Stadion, an accomplished scholar, but a thorough man of the world, averse to all religious enthusiasm. Wieland had been formerly prone to religious mysticism, but the gay pleasure-seeking life of the society with which he now came in contact, and the sceptical and cynical kind of literature now most at his command, produced an entire change of sentiment. The first production of his bearing the stamp of his new philosophy of life was the tale of 'Nadine,' which he called a composition in Prior's manner. This was followed in 1764 by 'Die Abenteurer des Don Sylvio de Rosalva' ('The Adventures of Don Sylvio de Rosalva'), a work in which he took Don Quixote as a model. In 1766-7 appeared his 'Agathon,' which established his reputation. His chief work devoted to the subject of love, which at this time occupied much of his attention, is 'Musarion' (1768), a production distinguished for grace, ease, and harmony. In 1770 he wrote 'Die Grazien' ('The Graces'); and the 'New Amadis' in 1771, a poem which celebrates the triumph of intellectual over mere physical beauty. In 1769 he was appointed professor primarius of philosophy at the University of Erfurt. In his 'Verklagter Amor' ('Cupid Accused') he defended amatory poetry; and in the 'Dialogen des Diogenes von Sinope' (1770) gave a general vindication of his philosophical views. In 1772 he was invited to Weimar by the Duchess Anna Amalia as tutor to her two sons, and now turned his attention to dramatic poetry, and wrote his 'Wahl des Hercules' ('Choice of Hercules'), and his 'Alceste.' He also edited the 'Deutscher Mercur,' a monthly, which he conducted till near the close of his life. His views, as exhibited therein, showed too much of the narrow conventional spirit of ranch criticism, and he was therefore attacked

by Goethe, who wrote a satire against him under the title of 'Götter, Helden, und Wieland' (Gods, Heroes, and Wieland), which Wieland answered with great good nature, recommending it to all who were fond of wit and sarcasm. Goethe and Herder were soon drawn to Weimar, where the Duchess Anna Amalia formed a circle of talent and genius. Schiller afterward joined the circle. In 1773 appeared his 'Geschichte der Abderiten.' 'Oberon' (1780), a romantic epic, is the most successful of his larger works. Wieland also prepared translations of Horace, Lucian, and the 'Letters' of Cicero. He superintended (1794-1802) an edition of his 'Works' in 45 volumes. These were also edited by Gruber (1818-28 and 1867-75), and there are many editions of selections, some of which have been translated into English. Consult: Loebell, 'Entwicklung der Deutschen Poesie' (1858); Ranke, 'Zur Beurtheilung Wielands' (1885); Hirzel, 'Wieland und Martin und Regula Künzli' (1891); and Gruber's biography, with his editions.

Wiener, vē'nēr, Leo, American author and educator. b. Russia 27 July 1866. He was educated at the gymnasium of Minsk and Warsaw, at the University of Warsaw and the Polytechnic of Berlin. From the latter city he went to New Orleans, worked in a cotton factory, and later sold fruit in Kansas City, Mo. He then obtained a position as teacher in Odessa, Mo., and afterwards a professorship in the University of Missouri, and was next appointed to his present position as assistant professor of Slavonic languages at Harvard. Among his publications are: 'History of Yiddish Literature in the 19th Century'; 'Anthology of Russian Literature'; 'Slavic Anthology'; and he has edited Rosenfeld's 'Songs from the Ghetto.'

Wiener-Neustadt, vē'nēr-noi'stāt, Austria. See NEUSTADT.

Wiertz, vērts, Anton Joseph, Belgian painter: b. Dinant 22 Feb. 1806; d. Brussels 18 June 1865. He studied art in the Antwerp Academy, where he gained, in 1832, a prize which enabled him to continue his studies in Rome. On his return to Belgium he lived at Liège for a time, and from 1848 at Brussels, where the Belgian government erected a large studio for him in 1850. Wiertz was a painter of great, though eccentric, genius, with a strange predilection for horrible and fantastic subjects, and invented a method of painting, called by himself *peinture mixte*, in which the characteristics of fresco and oil painting are combined. His principal pictures are: 'Greeks and Trojans contending for the Body of Patroclus'; 'The Flight into Egypt'; 'Death of Dionysius'; 'The Triumph of Christ' (1848), his masterpiece; 'The Things of To-day in the Eyes of the Men of the Future'; 'The Beacon of Golgotha'; 'The Last Cannon'; 'Napoleon in Hell'; 'A Second after Death.' He did not sell any of his chief paintings, which he bequeathed to the state, but supported himself by painting portraits. His Brussels studio, fitted up after his death as the Musée Wiertz, contains his large pictures. He wrote 'Eloge de Rubens' (1840); and 'Caractères Constitutifs de la Peinture Flamande' (1863). Consult Labarre, 'Antoine Wiertz' (1866).

Wiesbaden, vē'sbā-dēn, Prussia, (1) A town in the province of Hesse-Nassau, capital

of the government of Wiesbaden, and formerly capital of the Duchy of Nassau, beautifully situated among vineyards and orchards on the southern slopes of the Taunus range, about three miles north of the Rhine and 20 miles west of Frankfurt. It annually attracts about 80,000 visitors from all parts of Europe by its baths. Among notable buildings are the royal palace, the ducal palace, the town-house, the government buildings, the court-house, the museum and picture-gallery, the library (100,000 vols.), the royal court theatre, the Trinkhalle, and the Kurhaus, consisting chiefly of a large and splendid saloon, forming the east side of a square, while the north and south sides are lined by colonnades, filled with gay shops, and uniting a promenade and a bazaar. The springs, all of which except one are alkaline and among the most powerful of their class, are very numerous, and have temperatures varying from 100° to 153° F. The springs of Wiesbaden are spoken of by Pliny as the "Fontes Mattiaci," and on the Heidenberg, north of the town, traces of a Roman fortress were discovered in 1838, which seems to have been connected with the town by a wall, the Heidenmauer ("heathen's wall"), in the ruins of which votive tablets and inscriptions have been discovered. Pop. about 90,000.

(2) The government of Wiesbaden comprises almost the whole of the former Duchy of Nassau, most of the territory which belonged to the city of Frankfurt, etc. Area, 2,108 square miles; pop. about 1,200,000.

Wife. See **LAW OF HUSBAND AND WIFE.**

Wig, an artificial hair covering for the head to conceal baldness. The use of wigs is traced back to the ancients. They were used especially by the women. The fashion is said to have been copied by the Greek ladies from those of Egypt. Under the Roman emperors it became common even for men to wear wigs, and several of the emperors themselves used this ornament. In the latter half of the 16th century the fashion became much in vogue in France, Italy, and England. In 1560 no lady appeared at the French court without a blonde wig. Louis XIV. was at first averse to wigs; but in the latter part of his reign, when he began to lose his own hair, he reintroduced the fashion, which went to a greater extreme than ever. About 1660 they began to be worn by the clergy, who had at first shown themselves hostile to the practice. The practice of powdering these wigs was adopted about the year 1700. About 1720 the great wig began to give place to the queue, which remained the fashion till early in the 19th century. Modern refinement has abolished the wig as an ornament except in Great Britain for the lord-chancellor, judges, and barristers.

Wigan, England, a town of Lancashire, on the Douglas, 21 miles northeast of Liverpool. Wigan stands in the centre of an extensive coal field, and its manufactures, which are important, consist chiefly of calicoes, fustians, and other cotton goods, linens, checks, cotton twist, etc., besides iron foundries, iron forges, railway car works, iron rolling mills, large breweries, chemical works, and corn and paper mills. Pop. about 65,000.

Wiggin, wig'jin, Kate Douglas Smith, American author: b. Philadelphia, Pa., 28 Sept. 1857. She was educated at Abbott Academy, Andover, Mass., and in 1876 went to California,

where she studied the kindergarten system in Los Angeles, and later at San Francisco organized the first free kindergarten in the West. In 1880 she was married to S. B. Wiggin, a lawyer (d. 1889), and removed to New York. In 1895 Mrs. Wiggin was married to George C. Riggs. She published, with her sister, Nora A. Smith: 'Froebel's Gifts' (1895); 'Kindergarten Principles and Practice' (1896); etc. Her other works, several of which have attained great favor in this country and England include: 'The Bird's Christmas Carol' (1888); 'The Story of Patsy' (1889); 'A Cathedral Courtship' (1893); 'Mann Lisa' (1896); 'Penelope's Progress' (1898); 'Penelope's Experience in Ireland' (1901); 'Diary of a Goosegirl' (1902); 'Rebecca of Sunnybrook Farm' (1903); etc.

Wigglesworth, wig'lz-werth, Michael, American Puritan clergyman: b. Yorkshire, England, 1631; d. Malden, Mass., 10 June 1705. In 1638 he was brought to Charlestown, Mass., by his father and accompanied him in the same year to New Haven, Conn. He was graduated from Harvard in 1651, subsequently becoming a tutor there. He then studied theology and was settled as pastor of the Church of Malden in 1656. He was accounted skilful in medicine, and was offered the presidency of Harvard in 1684, but on account of ill health declined the honor. His best-known work, 'The Day of Doom' (1662), was a popular poem in New England for a long period. Two editions were printed in England and the 6th edition in New England appeared in 1715. The savage Calvinism of the poem is unsurpassed in literature save perhaps in Jonathan Edwards' sermon, 'Sinners in the Hands of an Angry God,' but the work contains not a little dramatic force and here and there passages of dignity and beauty. He also wrote: 'God's Controversy with New England' and 'Meat out of the Eater,' in verse; and 'A Discourse on Eternity.' Consult. Tyler's 'History of American Literature' (1878); and Dean, 'Memoir of Michael Wigglesworth' (1863, new ed., 1871).

Wight, wīt, Orlando Williams, American physician and translator: b. Centerville, N. Y., 19 Feb. 1824; d. Detroit, Mich., 19 Oct. 1888. He was educated at the Rochester Collegiate Institute, removed to New York in 1847, studied theology and was ordained to the Universalist ministry. He subsequently studied medicine, being graduated from the Long Island College Hospital in 1865. He engaged as a medical practitioner in Wisconsin, and was appointed state geologist and surgeon-general in 1874. He was health commissioner of Milwaukee in 1878-80, and health officer of Detroit in 1882-8. He was a noted translator and throughout his life devoted a large share of his time to literary work. He wrote: 'Maxims of Public Health' (1884); 'Peoples and Countries Visited' (1888); etc. His translations include: 'History of Modern Philosophy,' with F. W. Ricord (1852); 'Lives and Letters of Abélard and Héloïse' (new ed., 1861); Martin's 'History of France,' with Mary L. Booth (1863); etc. He also edited 'Standard French Classics' (14 vols., 1858-60); 'The Household Library' (18 vols., 1859, et seq.); etc.

Wight, Peter Bonnett, American architect: b. New York 1 Aug. 1838. He was graduated from the College of the City of New York

WIGHT, ISLE OF—WILBERFORCE

In 1855, practised as an architect in New York in 1861-71, and since 1871 in Chicago. He has been secretary of the Illinois State board of architects since 1897, was elected to the American Institute of Architects in 1866, and since 1900 has been secretary of the Municipal Art League of Chicago.

Wight, Isle of, England, off the south coast, in the county and opposite to the mainland portion of Hants, is separated from the mainland by the roadstead or channel of Spithead on the east, and by the Solent or continuation of this on the west. It is about 23 miles in length from east to west, by 15 miles broad; circuit about 70 miles; area, 140 square miles. The general appearance of the island is exceedingly diversified; the air is remarkably healthful. Only a small portion of the surface is waste. The downs, which cross the island from east to west and form excellent sheep-walks, separate it into two districts, which in their general character contrast with each other, the soil on the north side being generally a stiff, cold clay, and on the south side a fertile sandy loam. Excellent cement is manufactured at the works on the west side of the Medina, and largely exported. The chief imports are cattle, coal, timber, and building material. The island is well defended, being protected on the east side by Sandown Fort, Bembridge Fort and Battery, and by other forts which lie between the island and the mainland. The western approach is guarded by Hurst Castle and other forts.

The chief towns are Newport (the capital), Ryde, Cowes, Ventnor, Brading, Yarmouth, and the fashionable health-resorts of Sandown and Shanklin on the southeast coast. Osborne, near Cowes, was a residence of Queen Victoria, and with its beautiful grounds is now a national memorial, the gift of Edward VII.

Among the antiquities of the Isle of Wight the most interesting is Carisbrooke Castle, which stands a little southwest of Newport, and consists of extensive and well-preserved picturesque ruins. It has many historical associations: it is supposed to have originally been a fortress of the Britons, was afterward repaired and enlarged by the Romans, was considerably strengthened under Cerdic, who founded the kingdom of Wessex, and rebuilt in the reign of Henry I. During the Parliamentary war it became the asylum of King Charles I. on his escape from Hampton Court, and afterward his prison. Another interesting remain is Quarr Abbey, about 2½ miles from Ryde, which was built in 1132, and is now a farmhouse. Pop. about 85,000.

Wigwam, among the American Indians a name applied to a hut or cabin, generally of a conical shape, formed of bark or mats laid over stakes planted in the ground, and converging toward the top, where there is an opening for the escape of the smoke. The word has also been applied to a large temporary structure for public gatherings.

Wilars de Honacourt, vè-lâr dê hôn-koor, French architect of the 13th century. He is one of the earliest recorded experimenters with the perpetual motion theory, his rude drawings of his plans being still preserved in his sketch book at the Ecole des Chartes at Paris.

Wilber, wil'ber, Neb., village, county-seat of Saline County; on the Big Blue River and

on Chicago, Burlington & Quincy railroad; 30 miles southwest of Lincoln. It is in a rich agricultural region, in which the chief products are wheat and corn. It has flour mills, grain elevators, machine shop, creameries, and cigar factories. There are six churches, a high school, and a county court-house. The two banks have a combined capital of \$75,000.

Wilberforce, wil'ber-fôrs, **Robert Isaac**, English clergyman, 2d son of William Wilberforce (q.v.); b. Clapham, Surrey, 19 Dec. 1802; d. Albano, Italy, 4 Feb. 1857. He was graduated from Oriel College, Oxford, in 1823, and was subsequently chosen fellow of his college, associating in that capacity with Pusey and Newman, Hurrell Froude and other leaders of the high church party. In 1830 he left Oxford to take charge of a parish, and became vicar in 1840 of Burton Agnes, Yorkshire. He published 'Church Courts and Discipline' (1843); 'Lucius, or Stories of the Third Age' (1842); 'Doctrine of the Incarnation' (1848); and 'Doctrine of Holy Baptism' (1849), the two last attracting great attention by the very positive doctrines they enunciated. He also published a 'History of Erastianism' (1851); 'Doctrine of the Eucharist' (1852); 'Inquiry into the Principles of Church Authority' (1854); etc. Finding that he could no longer consistently hold his position in the Church of England, he was received into the Roman Catholic Church in Paris in October 1854.

Wilberforce, Samuel, English prelate, 3d son of William Wilberforce (q.v.); b. Clapham, Surrey, 7 Sept. 1805; d. near Dorking, Surrey, 19 July 1873. He was graduated from Oriel College, Oxford, in 1826, ordained deacon in 1828, and appointed curate of Checkendon, Oxfordshire, the same year. He was rector of Brightstone, in the Isle of Wight, 1830-40, in 1839 became archdeacon of Surrey, and in 1840 a canon of Westminster. In the last named year also he became rector of Alverstoke, Hampshire. He received the deanery of Westminster in March 1845, but before the close of that year was promoted to the bishopric of Winchester. He was the leader of the High Church party, though much opposed to ritualism, and was both witty and eloquent as well as a skilful debater in the House of Lords. His readiness in argument and his versatile qualities gained him the title of "Soapy Sam." He published 'Notebook of a Country Clergyman' (1833); 'Eucharistica' (1839); 'A History of the Protestant Episcopal Church in America' (1844); 'University Sermons'; etc. Consult the 'Life' by his son, R. G. Wilberforce (1888); Daniell, 'Bishop Wilberforce' (1891).

Wilberforce, William, English philanthropist; b. Hull, Yorkshire, 24 Aug. 1759; d. London 29 July 1833. Educated at Cambridge, he was in 1780 elected member of parliament for his native town; and in 1784 was returned both by his former constituency and by that of the county of York. He chose to represent the latter. In 1786 he made the acquaintance of Clarkson, who gained his sympathies on behalf of the agitation against the slave-trade, to which he henceforth devoted all his energies in parliament till the agitation proved successful. He first called the attention of the house to the subject in 1787, and in 1791 moved for leave to bring in a bill to prevent further importation of

African negroes into the British colonies. Year after year he pressed this measure, but was always defeated till 1807, when it was passed during the short administration of Fox. But his exertions in the cause of the slave were not over. Having secured the abolition of the slave-trade in the British colonies, he next addressed himself to the task of obtaining emancipation for those already reduced to or born in slavery. In 1812, after having sat for Yorkshire in six parliaments, he withdrew from the representation, and until 1825, when he retired from parliament, sat for the borough of Bramber. He died shortly after the government plan for the total abolition of slavery in the British colonies had passed in the House of Commons. His remains were interred in Westminster Abbey, and his funeral was attended by distinguished men of all parties. Wilberforce was the author of a treatise entitled 'A Practical View of the Prevailing Religious Systems of Professed Christians in the Higher and Middle Classes contrasted with Real Christianity' (1797). Consult: 'Life of William Wilberforce' by his sons (1838); his 'Correspondence' (edited 1840); and 'Private Papers of William Wilberforce' (edited 1897).

Wilberforce University, an institution for the education of the colored race located at Wilberforce, a suburb of Xenia, Ohio. It was founded in 1856 under the auspices of the African Methodist Episcopal Church. It includes the Collegiate Department, the Normal Department, the Payne Theological Seminary, a Law Department, the Academic Department, and Music and Commercial departments, and a Nurses' Training School. Women are admitted to all departments. The Collegiate Department offers two four years' courses, the classical and the scientific leading to the degrees of A.B. and B.S. The Theological Seminary offers a three years' course and confers the degree of B.D. A practice school is connected with the work of the Normal Department. Industrial training is not included in the curriculum; students, however, care for their own rooms. Emphasis is placed upon the development of moral character; there are few rules for behavior and government, but these are strictly enforced. The income in 1910 amounted to \$65,000; the grounds and buildings were valued at over \$380,000; a new dormitory was built in 1900-1; the library contained 10,000 volumes. The students numbered 340 and the faculty 27.

Wilbrandt, wī'brānt, Adolf, German dramatist, novelist, and biographer: b. Rostock 24 Aug. 1837. He was educated in Berlin and in Munich, traveled in Italy and France, and in 1871 became director of the Hofburg theatre in Vienna. He resigned his position in 1889, returned to Rostock, and has since occupied himself in literary pursuits. He wrote biographies of Heinrich von Kleist (1863), Hölderlin, and Fritz Reuter, the two last published in 'Fahr-ende Geister.' His dramas have met with great success, and among them may be mentioned: 'Der Graf von Hammarstein' (1870); 'Gracchus' (1872); 'Giordano Bruno' (1874); 'Kriemhild' (1877); etc. His novels treat with skill the social and literary problems of the day. They include: 'Adams Söhne' (1890); 'Der Dornenweg' (1894); 'Feuerblumen' (1900); 'Villa Maria' (1902); etc.

Wilbur, wīl'bər, John, American preacher of the Society of Friends: b. Hopkinton, R. I., 17 July 1774; d. there 1 May 1856. He was a teacher and surveyor, who was a strongly conservative member of the Society of Friends and opposed innovations which he believed to be at variance with the original doctrine of the society. For his alleged statements reflecting on J. J. Gurney (q.v.), the English Quaker, he was denounced by several members of the Rhode Island yearly meeting of 1838. He was sustained by a large majority of his own (South Kingstown) monthly meeting; but that meeting was dissolved and its members added to the Greenwich meeting, by which he was formally disowned in 1843. This action was confirmed by the quarterly meeting and the Rhode Island yearly meeting. Wilbur's adherents then withdrew from the orthodox society in such numbers as to form an independent conservative yearly meeting whose members were styled Wilburites (q.v.). Among Wilbur's writings, largely polemical, was 'A Narrative and Exposition' (1845). His 'Journal and Correspondence' appeared in 1859.

Wilburites, a branch of the Society of Friends, or Quakers, who adopted the principles of the Rev. John Wilbur, and maintain an independent yearly meeting. Wilbur became a preacher of the Society of Friends, and took a strongly conservative stand against what he regarded as innovations antagonistic to the original doctrines of the society. He was also accused of making unjust charges against Joseph John Gurney, the noted English philanthropist and preacher of the Society of Friends, when Gurney visited the United States. Wilbur was sustained by his own monthly meeting of South Kingstown, but that meeting was dissolved and its members added to the Greenwich meeting. The latter disowned Wilbur, and its action was confirmed, after an earnest controversy, by the quarterly meeting and the Rhode Island yearly meeting. Wilbur's followers thereupon formed an independent meeting, which in 1902 included 38 ministers, 53 churches, and 4,468 communicants. See FRIENDS, THE RELIGIOUS SOCIETY OF.

Wilcox, wīl'kōks, Cadmus Marcellus, American soldier: b. Wayne County, N. C., 19 May 1826; d. Washington, D. C., 2 Dec. 1890. He was graduated from West Point in 1846, served in the Mexican War, and in 1860 was promoted captain. In 1861 he resigned from the army and entered the service of the Confederacy. He participated in the first battle of Bull Run, was promoted brigadier-general in October, and in 1863 became major-general. He was engaged in the second battle of Bull Run, at Fredericksburg, Chancellorsville, Salem Heights, Gettysburg, and other important battles, and was present at the surrender at Appomattox Court-house. He was offered a commission as brigadier-general in the Egyptian army after the close of the Civil War, but declined it. In 1886-9 he was chief of the division of railroads at the general land-office in Washington. He wrote 'Rifles and Rifle Practice' (1859); translation 'Austrian Infantry Evolutions of the Line' (1860); and an excellent 'History of the Mexican War,' the manuscript of which was completed and published by his niece, M. R. Wilcox (1892).

WILCOX — WILDBAD-GASTEIN

Wilcox, Ella Wheeler, American poet: b. Johnstown Centre, Wis., 1855. She was educated at the University of Wisconsin and in 1884 began her literary career by contributing to the periodical press, and her work has been widely read and extensively reprinted. 'Poems of Passion' (1883) is perhaps her best known work. Among her other publications, in verse, are: 'Drops of Water' (1872), 'Maurine and Other Poems' (1876); 'Poems of Pleasure' (1887); 'The Beautiful Land of Nod' (1892); etc. She has also written the novels: 'Mal Moulée' (1885); 'A Double Life' (1890); 'An Erring Woman's Love' (1892); 'The Story of a Literary Career' (1904).

Wilcox, Marston, American author: b. Augusta, Ga., 3 April 1858. He was graduated from Yale in 1878, studied in Germany, and was subsequently admitted to the New York bar. He has acted as instructor at Yale, was associate editor of the 'New Englander' and the 'Yale Review,' and since 1893 has been engaged in editorial and other literary work in New York. He has published: 'Real People' (1886); 'A Short History of the War with Spain' (1898); 'Harper's History of the War with the Philippines' (1900); etc.

Wilcox, Robert William, American legislator: b. Kūhū, Honolulu, Hawaii, 15 Feb. 1855; d. Honolulu, Hawaii, 24 Oct. 1903. He was educated in Hawaii and at the Royal Military Academy, Turin, Italy. He was a member of the native legislature, led the revolution to restore the old constitution in 1889, and in 1895 again commanded a revolution, on this occasion for the purpose of restoring Queen Liliuokalani to the throne. He was captured and sentenced to death, but through the mediation of the United States Congress the sentence was commuted to 35 years' imprisonment and \$10,000 fine. He was pardoned, conditionally in 1896, and fully in 1898, by President Dole. He was elected a delegate to the United States Congress in 1901 and served one term.

Wild, Heinrich, hin'rin vilt, Swiss meteorologist: b. Uster 17 Dec. 1833; d. Zürich 5 Sept. 1902. His education was obtained at Zürich, Königsberg, and Heidelberg, and from 1863 to 1865 he was director of the central meteorological bureau at Bern. He was called to St. Petersburg, and was director of the Russian meteorological service 1868-95, when he retired. He invented the polaristrobometer, a polarization pluviometer, a magnetic theodolite, and other optical instruments, edited the Russian 'Neues Repertorium für Meteorologie,' and published 'Temperatur-Verhältnisse des russischen Reichs' (1876); and technical papers.

Wild, wîld, Jonathan, English thief and informer: b. Wolverhampton, England, about 1682; d. London 24 May 1725. He was a Birmingham buckle-maker who in 1706 went to London intending to engage in his trade, but becoming involved in debt was imprisoned for four years, after which he became a receiver of stolen goods and an informer against such criminals as were not in his employ. He was hanged at Tyburn. He was the subject of Fielding's satire, 'History of the Life of the Late Mr. Jonathan Wild the Great' (1743) and also appears in Ainsworth's novel, 'Jack Shepherd,' as well as in various other tales and pretended biographies.

Wild Hunt (Ger. *Wilde Jagd*; also *Wäthener*), in German folk-lore, a fancied noise in the air at night, most usually supposed to be heard between Christmas and Epiphany. The sound is compared to that of a spirit host rushing along, accompanied by the shouting of huntsmen and the baying of dogs. The root of the notion is thought to lie in the Christian degradation of the old heathen gods. Like Odin, the lord of all atmospheric and weather phenomena, and consequently of storms, the wild huntsman also appears on horseback, in hat and cloak, accompanied by a train of spirits—by the ghosts of drunkards, suicides, and other malefactors, often without heads, or otherwise mutilated. When he comes to a crossroad, he falls, and gets up on the other side. Generally he brings hurt or destruction, especially to any one rash enough to address him or join in the hunting cry, as many persons valiant in their drink have done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts heroes of the older or of the more modern legends take the place of Odin: thus, in Lusatia, Dietrich of Bern; in Swabia, Berchthold; in Sleswick, King Abel; in Lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderateness or cruelty in sport, or for hunting on Sunday, were condemned henceforth to follow the chase by night. In Lower Germany there are many such stories current of one Hakkelerend, whose tomb even is shown in several places.

Another version of the wild hunt is to be found in the legend prevalent in Thuringia. There the procession, formed partly of children who had died unbaptized, and headed by Frau Holle or Holda, passed yearly through the country on Holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man with white hair, the faithful Eckhart, preceded the spirit-host to warn the people out of the way. In one form or other the legend of the wild hunt is spread over all German countries, and is found also in France, and even in Spain. In England we meet substantially the same notion in folk-lore—phantom dogs, like the black Shuck-dog of Norfolk and the Mauthe hound of Peel in Man, the 'Wisht Hounds' of Dartmoor, headless horses, a ghostly coach, and horses swept along in a storm of wind. Such tales, with innumerable variants, are in fact found in the mythical and legendary records of all the older peoples.

Wild Irish Girl, *The*, a novel by Lady Morgan, published in 1806. It instantly became a favorite, in England went through seven editions in less than two years, and in 1807 reached its fourth American edition. The story is in the form of letters, and suffers from the consequent limitations; but the sketches of Irish life are curious and picturesque.

Wildbad-Gastein, vîlt'bâd gâs'tîn, Austria, a watering-place in Gastein valley, 3,000 feet above the sea, 48 miles south of Salzburg, with thermal springs varying from 64° to 100°, and containing some salt and carbonates of magnesium and lime. The place gives the name to a

WILDCAT

treaty signed here in 1865 by the emperor of Austria and the king of Prussia, the non-observance of the terms of which led to the German war of 1866.

Wildcat, any of the smaller species of feline animals (family *Felidae*, q.v.) in its feral condition; a lynx. The term is a general one applying to all the smaller felines; but locally has usually some specific application. Thus in European books and speech the "wildcat" properly and ordinarily means *Felis catus*, formerly well-known in all forested districts from the British Isles to Siberia, and still to be found in the less settled districts of the continent south of Sweden, though extinct in Great Britain, France, and Italy; it is also numerous in northern Scotland. The wildcat is larger, heavier, and more strongly built than the domestic cat (to which it has contributed little, if anything; see CAT), has a stouter head and shorter and thicker tail, which does not taper; besides other peculiarities. Its body is yellowish gray, with a dark stripe along the spine, and with numerous darkish stripes descending more or less vertically down the sides, marking the limbs transversely and forming rings around the tail. It is noted for its savagery, and thoroughly tamed examples are very rare, if any ever existed. Like most of the wild felines the female makes her nest in a hollow tree, or cleft of rocks, in an abandoned crow's nest, or some similarly convenient place, and brings forth there in early summer an annual litter of young, which show the ferocity of their native disposition from the start.

Lynxes.—The other European wildcat, and the North American wildcats, are lynxes, formerly set apart in a separate genus (*Lynx*); but most modern zoologists do not do so. "The lynxes," says Mivart, "are animals which present a markedly different aspect from that of other cats. Their legs are long, and their tail is, with one exception (that of the caracal), very short. Their ears also are tufted at the tip. The pupil is linear when contracted. The orbits are incompletely surrounded by bone. They have no tooth representing the common cat's first upper premolar, while that answering to its second upper premolar is largely developed. The intestines are also very short. . . . Still the above given characters are variable in the cat group. In some cats other than lynxes the tail is short, and some have the ears more or less penciled. Some, as we have seen, have long legs, and in many the upper premolar is wanting. The lynxes, therefore, cannot be separated off as a nominally distinct group or genus. The lynxes are very variable in their color and markings, and the Northern lynx also varies greatly in the abundance of its hair, according to the season,—the animal having a very different aspect in winter from that which it presents in summer. The Northern lynxes are generally reckoned as forming two species, one belonging to the Old World (*F. borealis*), and at least one species belonging to the New (*F. canadensis*). The American forms are often also described as alone constituting three species—namely, *F. canadensis*, *F. rufa*, and *F. maculata*. After a careful examination . . . I am, however, not only quite unable to regard the American varieties as anything more than varieties, but I am inclined to the opinion that

there can be no real specific distinctness between the Northern lynxes of the two hemispheres, their skulls as well as their skins being so much alike."

The European lynx is still found in northern Scandinavia, Russia, and eastward, and in some of the wilder mountain chains of central Europe. It is reddish gray, as a rule, indistinctly spotted or not at all, most prominently when young. A large one will measure 40 inches from the snout to the root of the short, thick tail. The lynx of northern America is very similar, the color grading from nearly uniform grizzly gray in far northern specimens which are the largest in average size, toward the reddish and yellowish, more or less spotted southern specimens, which run much smaller: these colors are always brighter in summer than in winter. The long hair depending from the cheeks is characteristic of the group, especially in old males, and gives a very grim aspect to the countenance. These variations, which are local in some of their manifestations, have led the more recent school of American zoologists, led by Merriam, to name several species and subspecies. Thus the Canadian lynx (*F. canadensis*) is not regarded as findable south of Canada, and is characterized by its long gray unspotted coat. The lynxes or "bobcats" of the United States generally are *F. rufa*, yellowish brown spotted on the sides, with dark brown, and having other markings; a subspecies (*maculata*), more profusely spotted, extends the range of the cat to the Pacific coast; and various other subspecies, distinguished by color, are found in the Gulf States and westward to Central America. All have substantially the same rapacious qualities and habits, varying with the character of the country and climate in which each variety lives, and the kind of small animals upon which they must depend for food. They are chiefly solitary and nocturnal; and soon disappear from all well-settled regions.

African and Asiatic Wildcats.—The Egyptian or gloved cat (*F. caligata*) is most interesting of the Old World wildcats, because it is the source, or main source, of our domestic races (see CAT). It inhabits northern Africa, and is about a third smaller than the European wildcat; it is yellowish, growing nearly white on the belly, and has obscure stripings on the body, limbs, and tail, which is rather long, slender, and tipped with black, while the feet are usually blackish. Another well known African cat is the large, long-legged serval (*P. serval*) which is to be found throughout the whole continent. It becomes as much as 40 inches long from nose to root of tail, and the tail may be 16 inches in length. In color it is tawny, with black spots, forming two irregular bands along the back, and black rings on the tail; its fur is a valuable commodity. Three or four other species dwell along the West African coast, as the rare red-brown "golden-haired" cat (*F. rufila*), the smaller gray, spotted, *P. neglecta*, and the more yellowish *F. servalina*, but none is well known.

Asia and the Malayan archipelago have a large number of wildcats, some of which when better known may prove to be mere local varieties of other species. The most familiar are the common Indian wildcat (*F. torquata*), which has much resemblance to the European

one, but is more slender, a brighter fulvous in tint, and less striped. Another wide-ranging species in India is the chaus, or jungle-cat (*F. chaus*), about 26 inches long to the tail, which measures 9 to 10 inches and drops to the heels. It is yellowish gray, more or less dark and unspotted, more reddish on the sides, where it unites with the lower parts; a dark stripe extends from the muzzle to the eye, and there are faint bars on limbs and tail. A very similar species, restricted to the arid plains of northern India, is the "ornate" jungle-cat (*F. ornata*). Another large East Indian cat, known from Nepal to Borneo, but nowhere numerous, is called the baycat (*F. aurata*), in reference to its bay-red color, which is unspotted and becomes whitish on the under surfaces. India also has several spotted cats, of which the best known is the widely distributed fishing-cat (*F. viverrina*), which may be 30 to 32 inches long in body, with a tail 9 to 10 inches long; it feeds mainly on fish, snails, and other mollusks, yet is noted for its ferocity, and has even been known to seize and carry away small native children. This cat is dark gray in general color, profusely spotted and striped with blackish like a civet. Smaller, more yellowish, and much spotted, is the Indian leopard-cat (*F. bengalensis*) which occurs in all parts of India and eastward to Java. Resembling it, but smaller, is the rare wagati; but more distinct and richly ornamented is the tiger-cat (*F. marmorata*), whose tawny coat is marbled or clouded with elongate wavy black lines and commingling spots. It is of small size, but has a very long spotted tail. In the jungles of southern India the sportsman encounters about grassy places a small handsome species, with slender body and head, and rather short legs and long tail, called the rusty-spotted cat (*F. rubiginosa*), which is greenish gray with white under parts, and has dark stripes and lines of small spots extending from nose to rump, and pretty white marks about the face. A similar species (*F. chinensis*) occurs in southern China and Formosa; and several others in the Malayan region. It is quite likely that future increase of knowledge and connecting specimens will bring them all under one name. In Borneo, however, occurs a very distinct little cat (*F. badia*), tinted bright chestnut, white on the breast and belly, and without markings, except a few on the face, and a streak on the long tapering tail. The flat-headed cat (*F. planiceps*) of Malacca, Sumatra, and Borneo, is another distinct form. It is about the size of a domestic cat, but the body is unusually long, the neck short and thick, the head globular and flat on top, the legs remarkably short, and the tail short and thick. Its fur is dark-brown above, each hair tipped with white, and it is spotted white on the lower parts, with yellow lines forming a V on the face. Central Asia has several notable wildcats, as the manul (*F. manul*), the steppe cat (*F. caudatus*), and Tibetan tiger-cat (*F. scripta*), all of which are handsomely striped or spotted, or both.

American Tropical Cats.—South and Central America are the home of a large variety of small felines, as well as of the puma and jaguar. Of these the most notable are the eyra, ocelot, and jaguarondi (qq.v.) elsewhere described. In addition to these are several of much local interest. The margay or chati (*F. tigrina*) is a widespread and variable species,

which is met with from Mexico to Paraguay, in warm and well-wooded lowland regions. Its fur may be a grizzly gray, or vary from that to a fox-red, profusely marked with black spots and rings, which extend along the tail, but do not form rings. There are three upright bars upon each cheek. The margay measures about two feet in length of body, and its tail about 11 inches. Geoffroy's cat (*F. guigna*) is a little known species of southern Brazil; and may turn out a variety of the colocola (*F. colocola*) of the same region, which is whitish gray with elongated spots on the face, and along the sides. The Pampas cat or straw-cat (*F. pajeros*) is a well-marked form. It is much larger and more robust than a house-cat, with short thick legs, a short, club-shaped tail, thick neck, and small head, with great round eyes and very small ears. This appearance of weight and size is largely due to the unusual length of the hair, which is yellowish gray, marked with transverse brownish bands on the body, patches on the face and rings around the tail. It inhabits the open plains of Argentina, and with similar habits has become a curious counterpart of the manul of the Asiatic steppes.

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Wilde, wild, George Francis Faxon, American naval officer: b. Braintree, Mass., 23 Feb. 1845. He was graduated from the United States Naval Academy in 1864 and in 1864-6 was attached to the Brazil squadron. He received promotion to lieutenant-commander in 1869, to commander in 1885, and while commanding the despatch boat Dolphin in 1885-8 made a trip around the world, the Dolphin being the first steel vessel in the United States navy to accomplish that feat. He became captain in 1898, commanded the ram Katahdin in the Spanish-American War, and later, in command of the Boston, he landed the first marine troops ever landed in China, sending them to guard the legation at Peking. He captured Iloilo in the Philippine Islands in 1899, and was placed in command of the Oregon in that year. In 1900 he captured Vigan in the Philippines, and he was in command of the Oregon when she was grounded on an uncharted ledge of rock in the Pechili Gulf. In 1901-2 he was in command of the navy yard at Portsmouth, N. H., and since 1902 has been in charge of that at Boston.

Wilde, Jane Francesca Elgee, LADY ("SPERANZA"), Irish poet: b. Wexford, Ireland, 1826; d. Chelsea, England, 3 Feb. 1896. She was married to Sir William Robert Wills Wilde in 1851. Her literary career began in 1845 with her contributions in prose and verse to the 'Nation.' The publication of her essay 'Jacta alea est,' under her pen-name 'Speranza,' was made the basis of the unsuccessful prosecution of the editor after the suppression of the 'Nation' in 1848. Among her writings are: 'Ugo Bassi' (1857); 'Poems by Speranza' (1871); 'An

WILDE — WILDERNESS, THE BATTLE OF THE

cient Legends, Mystic Charms, and Superstitions of Ireland' (1887); 'Notes on Men, Women, and Books' (1891); 'Social Studies' (1893); etc.

Wilde, Oscar (Fingal O'Flahertie Wills), Irish poet: b. Dublin, Ireland, 1856; d. Paris 30 Nov. 1900. His father was Sir William Wilde, a noted surgeon, and his mother was Lady Jane Wilde (q.v.). He was graduated from Oxford in 1878, winning the Newdigate prize for English verse. In 1879 he went to live in London, where he soon became the leader of the so-called aesthetic movement and was satirized by Du Maurier as 'Postlethwaite' in 'Punch,' and by Gilbert in the opera of 'Patience.' He visited this country in 1882, lecturing extensively on art topics, and later lectured similarly in his own country and in Paris. In 1895 he was convicted of a serious moral offense and condemned to penal servitude for two years. During his imprisonment he wrote 'A Ballad of Reading Gaol,' a poem of great force, and 'De Profundis,' published in 1905. His other published works include: 'Poems' (1880); 'The Picture of Dorian Gray,' a novel; 'The Happy Prince and Other Tales' (1888); the tragedies 'Guido Ferranti' (1890), and 'The Duchess of Padua'; 'Intentions,' essays (1891); 'Lord Arthur Savile's Crimes, and Other Stories' (1891); 'Lady Windermere's Fan,' 'A Woman of No Importance,' and 'The Importance of Being Earnest'; etc. His comedies are extremely clever, and his poems are characterized by melody of movement and beauty of thought. A complete edition of his poems appeared in 1903.

Wilde, Richard Henry, American scholar: b. Dublin, Ireland, 24 Sept. 1789; d. New Orleans, La., 10 Sept. 1847. He came with his parents to the United States in 1797 and settled in Georgia, where he studied law, and in 1809 was admitted to the bar. He was elected attorney-general of his State and in 1815-17, 1824-5, and in 1827-35 was a member of Congress. He spent the years 1835-40 in Europe, made a special study of Dante and Tasso, and was instrumental in the discovery of a portrait of Dante by Giotto on the wall of the chapel of Bargello. He subsequently removed to New Orleans, re-engaged in law practice, and in 1844 accepted the chair of constitutional law at the Louisiana State University. He wrote the widely popular poem, 'My Life is Like the Summer Rose,' and also published: 'Conjectures and Researches Concerning the Love, Madness, and Imprisonment of Torquato Dante' (1842). His poem 'Hesperia,' edited by his son, was published in 1867.

Wilde, Thomas. See **TRURO, THOMAS WILDE, BARON.**

Wilder, wil'der, Alexander, American physician and author: b. Verona, N. Y., 14 May 1823; d. 19 Sept. 1908. He was graduated at Syracuse Medical College in 1850 and in 1852 began an editorial career on the Syracuse 'Star,' being subsequently connected with the Syracuse 'Journal' (1853), New York 'Teacher' (1856), and New York Evening Post (1858-71). He was an anti-Tweed alderman in New York in 1872, inspector of schools in 1873, and from 1875 to 1895 secretary of the National Eclectic Medical Association, editing 19 volumes of 'Transactions.' He was president

of the New York School of Philosophy. Among his published works are: 'Secret of Immortality Revealed' (1846); 'Neo-Platonism and Alchemy' (1869); 'Our Darwinian Cousins' (1873); 'Eleusinian and Bacchic Mysteries' (1874); 'Ancient Symbol Worship' (1874); 'Serpent and Siva Worship' (1875); 'Vaccination, a Fallacy' (1879); 'Psychology as a Science' (1884); 'The Soul' (1884); 'Higher Sources of Knowledge' (1884); 'Ethics and Philosophy of the Zoroastrians' (1885); 'Ancient Symbolism and Serpent Worship' (1886); 'Later Platonists' (1887); 'Antecedent Life' (1895); 'The Ganglionic Nervous System' (1900); 'Perennial Life' (1902); 'History of Medicine' (1902). He translated and edited 'Iamblichus on Egyptian Mysteries.'

Wilder, Burt Green, American physiologist: b. Boston, Mass., 11 Aug. 1841. He was graduated from the Lawrence Scientific School at Harvard in 1862, was assistant surgeon in the Union army in 1863-5, and in 1866 was graduated from the medical department at Harvard. He was assistant in comparative anatomy at the Harvard Museum of Comparative Zoology in 1866-7, and in 1867 accepted the chair of zoology, which he still occupies, at Cornell. In 1874-84 he was lecturer in physiology at the Summer Medical School of Maine. He has made many interesting researches concerning the habits of the spider, and since 1880 has spent much time in an endeavor to secure a simple anatomic nomenclature. In 1885-6 he was president of the American Neurological Association. He has written numerous professional papers, and has published in book form: 'What Young People Should Know' (1875); 'Health Notes for Students' (1883); 'Physiology Practicum' (1895); etc.

Wilder, Marshall Pinckney, American horticulturist: b. Rindge, N. H., 22 Sept. 1798; d. Boston, Mass., 16 Dec. 1886. He was engaged as a merchant in the West India trade at Boston after 1825, in 1839 was chosen to the State legislature, was president of the State senate in 1850, and in 1849 served as member of the Executive Council. He was prominent in the organization of the Constitutional Union Party, was a delegate to the convention which nominated Bell and Everett in 1860, and throughout the Civil War was a firm supporter of the Union. He founded the Massachusetts Agricultural Society, the Massachusetts Agricultural College, and was active in the movement which resulted in the establishment of the Massachusetts Institute of Technology. He was author of numerous articles on horticulture, and lectured extensively on the subject. Among his published addresses may be mentioned 'The Hybridization of the Camellia and Its Varieties' (1847).

Wilder, Marshall Pinckney, American professional entertainer: b. Geneva, N. Y., 19 Sept. 1859. His occupation was at first that of a stenographer, but he abandoned it in order to become a drawing-room entertainer, in which capacity he has been widely popular. He has published 'People I've Smiled With.'

Wilderness, The Battle of the. On 9 March 1864 President Lincoln handed to Gen. Grant his commission as lieutenant-general, and two days later placed him in command of all the

WILDERNESS, THE BATTLE OF THE

armies of the United States. Grant made immediate preparations for an early campaign to be conducted simultaneously, east and west. He made his headquarters with the Army of the Potomac. Before coming to the East he had expressed himself as favoring a coast movement, south of James River, and an advance on Richmond on that line. After his arrival at Washington and a study of the problem he proposed to act with the Army of the Potomac on what was known as the overland route from the Rapidan to the James, while Gen. Butler, with 30,000 men, should ascend James River from Fort Monroe, and establish himself in an entrenched position near City Point, whence he could operate against Richmond and its communications with the south, and at a proper time form a junction with the Army of the Potomac, moving down from the north. At the same time Gen. Sigel, commanding troops in West Virginia and the Shenandoah Valley, was instructed to form two columns, one of 10,000 men, under Gen. Crook, to move from the Kanawha and operate against the Virginia and East Tennessee Railroad, the other 7,000 strong, under Sigel, in person, to advance, as far as possible, up the Shenandoah Valley, to draw detachments from Lee. Grant's main reliance, however, was the Army of the Potomac, which, 30 April 1864, was composed of the Second, Fifth and Sixth corps of infantry and a cavalry corps, commanded respectively by Gens. W. S. Hancock, G. K. Warren, John Sedgwick, and P. H. Sheridan. The Ninth corps, Gen. A. E. Burnside, united with the Army of the Potomac on 6 May, but acted under the immediate orders of Gen. Grant, until the 24th, when it became a part of the Army of the Potomac. The strength of the army, including the Ninth corps, 30 April, was 118,769 officers and men, with 316 guns. The army was commanded by Gen. George G. Meade. Formed in battle line, two ranks deep, with one third in reserve, it would cover a front of 21 miles. Its train of 4,000 wagons was 65 miles long. The assigned duty of this army was to attack the Army of Northern Virginia, and by constant hammering destroy it and take Richmond. The Army of Northern Virginia, commanded by Gen. R. E. Lee, was composed of the First, Second and Third infantry corps, commanded by Gens. J. Longstreet, R. S. Ewell, and A. P. Hill. A cavalry corps of two divisions (Wade Hampton's and Fitzhugh Lee's) was commanded by Gen. J. E. B. Stuart. The most reliable estimate gives Lee's strength, present for duty, on 1 May 1864, as 48,700 infantry, 4,854 artillery, and 8,399 cavalry, an aggregate of 61,953 officers and men, with 224 guns. On 1 May the Army of the Potomac was encamped in the vicinity of Culpeper Court House, between the Rapidan and the Rappahannock, and the Ninth corps on the railroad from Manassas Junction to the Rappahannock. Lee's army lay south of the Rapidan, Ewell's corps above Mine Run, and A. P. Hill's on Ewell's left, higher up the Rapidan. Longstreet's corps was near Gordonsville. Stuart's cavalry lay along the lower Rappahannock. Lee's headquarters were near Orange Court House, 70 miles from Richmond. Lee's army being the first objective, it was finally determined to cross the Rapidan, turn his right and compel him to fall back toward Richmond or come out of his intrenchments and give battle on open ground.

The principal objection to this movement was the difficulty presented by the Wilderness, a forest of unusually dense growth, with an almost impenetrable undergrowth, where infantry could pass with great difficulty, and where cavalry and artillery could not be used. It was thought to avoid this difficulty by moving at night, crossing the Rapidan and getting through the Wilderness before Lee could discover the movement and intercept it by moving on the Orange turnpike and Orange plank road. These two roads lead from Orange Court House down the Rapidan toward Fredericksburg. They follow the general direction of the river and are almost parallel to each other; the turnpike nearest the river and the plank road a short distance south of it. Grant's proposed route lay directly across these two roads along the western borders of the Wilderness. The movement began at midnight of 3 May. Hancock's Second corps, preceded by Gregg's cavalry division, crossed the Rapidan at Ely's Ford and moved to Chancellorsville, where the entire corps with its trains had arrived by noon of the 4th. Warren's corps, preceded by Wilson's cavalry division, crossed the river at Germanna Ford and marched to Wilderness Tavern, at the intersection of the Germanna road by the Orange turnpike. It reached its position by 3 p.m. of the 4th. Wilson's cavalry was thrown forward to Parker's Store on the Orange plank road. Sedgwick's Sixth corps followed Warren's across the Germanna Ford and halted a short distance beyond it. The crossing of the river was very gratifying to Grant who regarded it as a great success, and it removed from his mind the most serious apprehension he had entertained "that of crossing the river in the face of an active, large, well-appointed and ably commanded army, and how so large a train was to be carried through a hostile country and protected." At noon of the 4th Grant knew that Lee was aware of his movement, upon which he sent a despatch to Burnside to make a forced march from beyond the Rappahannock to Germanna Ford, and by the morning of the 5th his advance was crossing the Rapidan. The orders for the 5th were for Sheridan, with two divisions of cavalry, to move against the Confederate cavalry, near Hamilton's crossing, and at 5 a.m. Wilson's cavalry division was to move to Craig's Meeting House, and reconnoitre the Orange pike and plank roads, and other roads on his right and left. Hancock's Second corps was to march from Chancellorsville to Shady Grove Church and extend its right toward Parker's Store, on the Orange plank road, to which point Warren's corps was ordered to advance from Wilderness Tavern. Warren, in turn, was to extend his right toward Sedgwick's Sixth corps, which was ordered to Wilderness Tavern. Gen. Lee interfered with the full execution of these orders. He had been expecting Grant to move on his right and when he saw on the morning of the 4th that the movement was being made, determined to attack him before he could get out of the Wilderness and ordered Ewell to march by the Orange pike and A. P. Hill down the plank road, and that night Ewell bivouacked within five miles of Wilderness Tavern, and Hill's advance division halted for the night at Mine Run, seven miles from Parker's Store, on the plank road, and about ten from the intersection of the Brock road. Longstreet moved from near Gordonsville at 4 p.m. Stuart's cavalry was

WILDERNESS, THE BATTLE OF THE

drawn in and ordered to cover the Confederate right. On the morning of the 5th Ewell continued his march on the Orange pike, under instructions to regulate his march with that of A. P. Hill, on the plank road, and both informed that it was not desired to bring on a general engagement before Longstreet came up, who was under orders to follow Hill on the plank road. When Ewell was two miles from the Wilderness Tavern, he halted, as he was three or four miles farther advanced than Hill. Warren had discovered that the Confederates, under Ewell, were in force two miles beyond Wilderness Tavern and before 7 A.M. had informed Meade of the fact, who ordered Warren to make an attack with his whole force. Sedgwick was directed to move up by a cross road, attack the enemy and connect with Warren on the turnpike, and a despatch was sent to Hancock, informing him of what had become known and directing him to halt at Todd's Tavern, until further developments. Warren had started early in the morning for Parker's Store, on the Orange plank road, and when near it Crawford's division had been ordered to halt in a good position on high ground, and finding that Wilson's cavalry at Parker's Store needed assistance Crawford threw forward a skirmish line that encountered the flankers of A. P. Hill's corps. Soon after 8 A.M. Crawford was informed by Warren that Griffin's and Wadsworth's divisions would attack Ewell on the turnpike and he was ordered to join in it with one of his brigades. Between 9 and 10 A.M. Hancock was ordered to move up the Brock Road to the Orange plank road and be prepared to move out that road toward Parker's Store, and about the same hour three brigades of Gen. Getty's division of Sedgwick's corps were ordered from the Wilderness Tavern to the intersection of the Brock road with the Orange plank road, and directed to move out the latter road and attack the enemy, and, if they could, drive them back beyond Parker's Store. As described by Humphreys, "The Brock road begins on the Orange pike about a mile east of the old Wilderness Tavern, and runs in a southeast direction to Spotsylvania Court House, intersecting the Germanna plank, the Orange plank, the Furnace, the Catharpin and other roads running in a southwest and south direction." Ewell had formed for battle across the Orange pike when about noon Warren opened the attack. Griffin's division advancing on both sides of the pike struck Johnson's division, broke it and drove it back. Rode's division was thrown in on Johnson's right, south of the pike, and supported by Early, who was formed across the pike, the line was re-established. After a severe and bloody fight Griffin was driven back, losing many prisoners and two guns. Wadsworth's division which had advanced on the left of Griffin, lost direction, exposed its left, and was thrown back in confusion. McCandless' brigade of Crawford's division, attempting to unite with Wadsworth's left, was nearly surrounded by Ewell's right and fell back with heavy losses, and Crawford's entire division had to be drawn in. Thus all the ground gained by Warren was given up and he assumed a new line somewhat in rear, but still in front of Wilderness Tavern, with his right on the Orange pike. He had lost more than 3,000 men. On his right Gen. Wright's division of Sedgwick's corps came up early in the afternoon, and with Neill's brigade

of Getty's division formed within 300 yards of Ewell's front, and repulsed one of his attacks. Soon after this Seymour's brigade of Rickett's division came up on the right of Neill, and about 5 P.M. two brigades of Sedgwick attacked Ewell's left and were repulsed. Meanwhile Gen. Getty, who had arrived at the crossing of the Brock road and the plank road, had been ordered to attack. Heth's Confederate division was in his front supported by Wilcox's. Hancock, who had been ordered from Todd's Tavern, 10 miles distant, by the Brock road, was instructed to support Getty, drive A. P. Hill beyond Parker's Store and connect with Warren's left. It was 3.15 P.M. when Getty received his order to attack. Meanwhile Hancock's advance had arrived and began intrenching on the Brock road. At 4.15 Getty advanced to the attack through the thick woods, and had gone less than 400 yards beyond the Brock road, when he became hotly engaged with Heth's division. Although Hancock had not completed his dispositions he moved forward to Getty's support and the fight became fierce and deadly at very close quarters, and continued until near 8 P.M., when darkness put an end to the fierce contest. Hancock had not gained much ground, but Hill's lines had been broken, and his right driven back by two brigades of Barlow's division. While Hancock and Getty were engaged, Wadsworth's division had been ordered in a southeast direction to strike the flank of the Confederates engaging them, but did not become seriously engaged and was halted by darkness, about a half mile from the Brock road. The Union army had fought in detachments, with no connection of its corps or divisions. Grant said that he had never seen such hard fighting, but prepared to renew it next day, and Hancock, Warren and Sedgwick were ordered to attack at 5 o'clock next morning, and Burnside was ordered to have two divisions in position between Warren and Hancock so as to advance with them. Each corps commander was advised of the instructions given to the others. To note briefly the action of the cavalry on the 5th, Wilson's division, after leaving 500 men at Parker's Store had proceeded toward Craig's Meeting House, on the Catharpin road, and was driven back on that road as far as Todd's Tavern. Gen. Gregg had found nothing at Fredericksburg, but had discovered two brigades of cavalry falling back from Hamilton's Crossing to Lee's right flank, and fell back to Todd's Tavern before 3 P.M. to check the enemy pursuing Wilson, and drove them back beyond Corbin's bridge.

During the night of the 5th Ewell's and Hill's corps strengthened their intrenchments and put artillery in position, and a few minutes before 5 A.M. of the 6th opened the second day's fight by an attack upon the Union right, which was promptly met by the advance of Wright's division of the Sixth corps, which made two vigorous assaults against the Confederate left, which were repulsed with severe loss. Warren made several attacks on Ewell's right which were repulsed. These persistent and unsuccessful attacks were continued until after 10 o'clock, when Sedgwick and Warren were directed to suspend them, to strengthen their intrenchments and throw up new works, in order that a part of their troops might be available for an attacking force to move from the vicinity of Hancock's right, which had been desperately en-

WILDERNESS, THE BATTLE OF THE

aged. Hancock had disposed Gibbon's and Barlow's divisions, both under command of Gen. Gibbon, to defend his left flank against an apprehended attack by Longstreet, and at 5 A.M. launched Birney's, Mott's and Getty's divisions, all under Gen. Birney, along the Orange plank road, Wadsworth's division of Warren's corps at the same time advancing on Birney's right. They fell upon Heth's and Wilcox's divisions of Hill's corps with great fury and after a desperate contest broke them and drove them a mile and a half, through the dense woods, under heavy loss, and back on the trains and artillery, and Gen. Lee's headquarters. Just before Hill's troops gave way the head of Longstreet's corps, which had marched nearly all night, came upon the field at Parker's Store, and was hastened along the plank road to relieve the divisions of Heth and Wilcox. Kershaw's division was in the lead and began to form on the right of the road. Humphreys says: "The advance through the forest, undergrowth, and swamps more than a mile, in a hot contest, had separated and disordered Hancock's corps, and Birney's left, met in this condition by Kershaw's division, was not only brought to a standstill, but at some points swayed back and forward, until at length Kershaw, himself leading his division, forced Birney's left back as far as his centre. Wadsworth's advance had crowded many of Birney's troops to the south side of the plank road, so that the greater part of his, Birney's, command was on the left of that road. Field's division of Longstreet's corps following close on Kershaw's division, some of it coming on the ground at double-quick, was formed on the Confederate left of the plank road, and, advancing, at once became hotly engaged with Birney's right and Wadsworth's troops, Gregg's Texans and Benning's Georgians in the lead, bearing the brunt of the fight and losing heavily in killed and wounded. R. H. Anderson's division of Hill's corps, following Field's division, formed on the same part of the line, one portion uniting with Field's troops in the attack, the other portion supporting. It was when Hancock's troops were partially checked by the fresh troops of Longstreet that the necessity of readjusting his formation became imperative. Regiments were separated from their brigades and mixed with others, and the line of battle was very irregular, and commanders were in this way losing the control of their troops. This was about half past six o'clock." At 9 A.M. Hancock again attacked with the divisions of Birney, Mott, Wadsworth, Stevenson's of Burnside's corps, and three brigades of Gibbon's division and though fighting furiously made no headway, and at 11 o'clock the firing on his front died away. Meanwhile Longstreet had discovered that Hancock's left extended but a short distance from the plank road and he moved a part of his command to the right to attack Hancock's left and rear, the flank movement to be followed by a general advance of his entire corps. The attack first fell on the left of the advanced line held by Frank's brigade, partly across the Brock road, which was fairly overrun and brushed away; it then struck the left of Mott's division, which in turn was driven back in confusion to the Brock road, and the confusion spread to the troops on the right, and Hancock was compelled to withdraw his entire corps to the Brock road from which

they had advanced in the morning, where they were re-formed in two lines behind their intrenchments. Wadsworth, on the right of Hancock, made heroic efforts, but his troops broke, and while striving to rally them he was mortally wounded and died within the Confederate lines next day. When this movement had succeeded Longstreet ordered a general advance, and while riding at the head of column, moving by the flank down the plank road, when opposite the force that had made the flank movement, which were drawn up parallel with the road, about 60 yards from it, a volley was fired which killed Gen. Jenkins, commanding the leading brigade of Field's division, and severely wounded Gen. Longstreet. Gen. Lee soon came up, postponed the attack to a later hour and extended his line so that its right rested on the unfinished Orange Railroad. Meanwhile a brigade of the Ninth corps, which had been sent to the left, under Gibbon, swept down in front of Hancock's line from left to right and cleared it of the enemy. In the action of the previous day there had existed an interval between Warren on the turnpike and Hancock on the plank road, through which Burnside was expected to advance and attack Hill and Longstreet in flank, but in advancing through the woods the enemy was encountered on a wooded crest near the plank road. An attack was not deemed advisable and Burnside's troops were moved farther to the left. It was not till afternoon and after Hancock's repulse that they became engaged, without accomplishing much, and toward evening they fell back and intrenched. The lull that had followed the successful attack of Longstreet gave Hancock time to re-establish his position, now strengthened by fresh troops sent by Gen. Meade, and Hancock was directed to renew the fight at 6 P.M. But again Lee anticipated the Union commander, and at 4.15 P.M., having gotten well in hand the troops of Longstreet and Hill, he advanced in force against Hancock's intrenched lines, until he came within 100 yards of the front one, when he opened a severe fire, which was heaviest on Hancock's left, and at the end of half an hour a portion of Mott's division and of a brigade of Birney's gave way in disorder. The moment this break occurred the Confederates pushed forward and Anderson's brigade of Field's division took possession of that part of the first line of intrenchments and planted their colors on them. Near the point where the line was broken through a fire had, during the afternoon, sprung up in the woods, and at the time of Lee's attack had communicated to the log breastworks on that part of the line. At the critical moment they became a mass of flames, which could not be extinguished and which extended for many hundred yards to the right and left. The heat and smoke were driven by the wind into the faces of the Union troops, preventing them on portions of the line from firing over the parapet, and at some points obliged them to abandon it. It was this condition of affairs that permitted Anderson's brigade to seize a part of the breastworks, from which they were quickly driven by Carroll's brigade, which was near at hand and which rushed upon them at the double-quick. By 5 P.M. Lee's troops had been completely repulsed in Hancock's front, and fell back with heavy losses in killed and wounded. Just before dark Ewell moved two brigades of Early's division around

the right of Sedgwick's corps, held by Ricketts' division, and in co-operation with the rest of Early's division, succeeded in forcing Ricketts back in some confusion, capturing Gens. Shaler and Seymour, brigade commanders, and a large number of their men. Wright's division, also, was thrown into some disorder but Wright restored order and Early drew back and formed a new line in front of his old one. During the night an entirely new line was taken up by the Sixth corps, its front and right thrown back, a change which was conformed to by the right of the Fifth corps. On the left Sheridan's and Stuart's cavalry had some severe fighting at and near Todd's Tavern (q.v.) in which Sheridan had the advantage. On the morning of the 7th reconnaissances were made of the Confederate position which was found well intrenched, neither commander showed any disposition to renew the fight on that field, and Grant decided to continue the movement by the left flank, and when darkness came the Union columns began their march for Spottsylvania Court House (q.v.). The Union troops engaged numbered about 101,000; the Confederates numbered about 60,000. The Union losses, as officially reported, were 2,246 killed, 12,037 wounded, and 3,383 missing, an aggregate of 17,666. The Confederate reports are very incomplete; the most reliable estimate places their entire loss at 7,750.

Consult: 'Official Records,' Vol. XXXVI.; Humphreys, 'The Virginia Campaign of 1864-5'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.; Swinton, 'The Army of the Potomac'; Walker, 'History of the Second Army Corps'; Grant, 'Personal Memoirs,' Vol. II.; Pennypacker, 'Life of Gen. Meade'; Long, 'Life of Gen. Lee'; Gordon, 'Reminiscences of the Civil War.'

E. A. CARMAN.

Wilderness Route, in American history, a famous emigrant road or trail from the Atlantic seaboard to Ohio through Cumberland Gap. Thousands of emigrants passed over this road to Ohio and Kentucky. The "Wilderness Road" was marked out by Daniel Boone. In 1775 the Transylvania Company, with Colonel Richard Henderson as head, engaged Boone to mark out a road from Fort Wautaga, on a branch of the Holston, to the Kentucky River, where the company's newly-purchased lands lay. "This I accepted," wrote Boone, "and undertook to mark out a road in the best passage through the wilderness to Kentucky with such assistance as I thought necessary to employ for such an important undertaking."

Wildea, Frank, American naval officer: b. Boston, Mass., 17 June 1843; d. on steamer China, off San Francisco, Cal., 6 Feb. 1903. He was graduated from the United States Naval Academy in 1863, served in the West Gulf Squadron, and later on the monitor Chickasaw. He was promoted master in 1866, became commander in 1880, was in charge of the Portsmouth, N. H., navy yard in 1885-8, and in 1894 was commissioned captain. He commanded the cruiser Boston at the Asiatic Station in 1895-8, and served under Dewey at the battle of Manila, 1 May 1898. In 1901 he was advanced to the grade of rear-admiral, was assigned to the Asiatic Station as junior squadron commander, and in 1903 was ordered home on sick-leave, but died on the way.

Wildfowl, in modern usage water-birds, as ducks, geese, and swans, pursued by gunners for sport or for market. American methods of wild fowling will be found given where these birds are described (see Duck, etc.) An interesting method in Europe, still extensively pursued in some parts of England, at the Fens, is by decoying wild ducks in large trap-ponds. The pond is constructed in a secluded place, well sheltered by trees, and with a plentiful supply of reeds and sedges. From this pond pipes or narrow passages are led, 60 to 80 yards, gradually narrowing toward the termination. Above, the pipe is bridged and covered by a light network, and at its termination it ends in a tunnel net, which is, as a rule, carried out on to the land. Decoy ducks, which come to be fed at the call of the attendants, are used to entice their wild neighbors into the pipe; but the decoy dog is perhaps a more valuable ally of the fowler. This dog is named a "piper." It is of a small breed, and indulges in playful gambols by the side of the pipe, appearing now and then in advance of the fowl, which, led by curiosity, swims onward toward the dog, and is thus drawn toward the terminal net. The dog preserves a perfect silence during its maneuvers. Devices of the same character are used in the Orient, especially in Japan. Another Old World method is by employing the stalking horse, still used in some parts of England; the body of the horse—which requires special training for its work—being used to conceal the sportsman from the game. Consult: Sanford and Van Dyke, 'Water Fowl,' American Sportsman's Library (New York 1903); Grinnell, 'American Duck-shooting' (New York 1901); Elliot, 'The Wild Fowl of the United States, Etc.' (New York 1898); Mayer, 'Sport with Rod and Gun' (New York 1892); Afalo, 'Sport in Europe' (London 1901).

Wiley, Harvey Washington, American chemist: b. Kent, Ind., 18 Oct. 1847. He was graduated from Hanover College in 1867; from the Indiana Medical College in 1872; from Harvard in 1873; and in 1878-9 studied abroad, chiefly at the University of Berlin. He was professor of chemistry at Purdue University in 1874-83, and in 1881-3 was also State chemist of Indiana. Since 1883 he has been chief chemist of the United States department of agriculture, occupying also the position of professor of agricultural chemistry at the graduate school of Columbia University since 1895. He has been secretary of the Association of Official Agricultural Chemists since 1889; was president of the American Chemical Society in 1893-5; and is connected with various other scientific organizations. He has made a specialty of sugar and glucose investigations and has been interested in the prevention of food adulteration. He has published: 'Songs of Agricultural Chemists' (1892); 'Principles and Practice of Agricultural Chemistry' (3 vols., 1894-7); etc.

Wiley University, an institution for the education of the colored race, located in Marshall, Texas. It was founded in 1873 by the Freedmen's Aid and Southern Educational Society of the Methodist Episcopal Church, by which it is now chiefly supported. It is open to both men and women. It has elementary, secondary, and collegiate departments, and normal,

commercial, and industrial courses. The Collegiate Department confers the degrees of A.B. and B.L. Industrial work and instruction is given in carpentry, bricklaying, printing, and sewing and cooking. The grounds and buildings in 1909 were valued at \$60,000; a building for general purposes was erected in 1900-1. The income in 1910 amounted to \$16,000; the library contained 6,000 volumes; the students numbered 623, and the faculty 28.

Wilfrid, or **Wilfrith**, **Saint**, Anglo-Saxon prelate: b. about 634; d. Oundle, Northamptonshire, 709. He studied at Lindisfarne, became a monk and in 653 accompanied Benedict Bishop to Rome in order to obtain an authoritative answer to the question of the proper time for celebrating Easter. On his return he obtained from Alchfrid, king of Northumbria, a grant of land and a monastery at Ripon, and here he was ordained priest in 664. In this same year he took a leading part in the conference at Wharfedale, where he persuaded the king to decree that, in the celebration of Easter, the Roman usage should be substituted for that of the Scottish Church, which had hitherto prevailed in Northumbria. At this time also the king appointed him archbishop of York, but having gone to France to be consecrated by a bishop holding orthodox views on the Easter question, he found on his return that his see was occupied by one of the opposite party, and he did not get possession till 669. Becoming obnoxious to King Egfrid (who had succeeded Alchfrid in 670), the king, to reduce his influence, divided his diocese into three, and when Wilfrid opposed this proceeding, deprived him of his see altogether (678). Wilfrid thereupon set out for Rome to obtain from the pope a reversal of the king's act of deposition. Having been driven by a storm on the coast of Friesland, he preached to the people (who had no difficulty in understanding the Anglo-Saxon) with such effect that all the princes and many thousands of the people offered themselves for baptism. Having reached Rome he easily obtained from the pope the desired decision, but during the reign of Egfrid remained under persecution or in exile; in 687, however, Aldfrid, who had succeeded Egfrid, reinstated him. But Aldfrid also in course of time was offended by his devotion to Rome, and Wilfrid was again deposed in 691. He then made another journey to Rome, and did not return till 705. Consult: Eddis, 'Vita Wilfridi,' in 'Historians of York,' Vol. I. 'Rolls Series'; Bright, 'Early English Church History' (3d ed. 1897); Hunt, 'The English Church from its Foundation to the Norman Conquest' (1899).

Wilhelm Meisters (vī'hēlm mī's'tērz) **Apprenticeship**, a novel by Goethe. The first part was published in 1796, after having occupied Goethe's attention for 20 years; its sequel, 'Wilhelm Meisters Wanderjahre' (travels) appeared 1821-9. The central idea of this great work is the development of the individual by means of the most varied experiences of life. There is no plot proper, but in a series of brilliant episodes the different stages of the hero's spiritual growth are brought before the reader. Wilhelm Meister is a young man with many admirable qualities of character, but passionate and emotional, somewhat unstable, lacking reflection and proper knowledge of the world.

The book gives a richly colored picture of the life of Goethe's time.

Wilhelmina I. vī'hēl-mē'nā (**Wilhelmina Helene Pauline Marie**), queen of the Netherlands. b. The Hague 31 Aug. 1880. She is the daughter of King William III. of the Netherlands by his second wife, Emma of Waldeck. She became queen on the death of her father in 1890, but as she had not attained her majority her mother ruled as queen-regent; Wilhelmina meanwhile was carefully educated under the best tutors. Shortly after her 18th birthday, on 6 Sept. 1898, she was crowned queen at Amsterdam. Her charming personality and strength of character have made her very popular with her people; she has also been strongly influenced by her mother, who is equally well loved by the people. In February 1901 she was married to Henry Frederick, Duke of Mecklenburg-Schwerin.

Wilhelmshaven, vī'hēlma-hā-fēn, Germany, town and naval station, on the northern coast of the duchy of Oldenburg, at the west entrance of the Bay of Jade; 40 miles northwest of Bremen, with which it is connected by rail. In 1853 the land was bought from Oldenburg by Prussia, and the town laid out in 1856; it was first used as a naval station in the Franco-Prussian war, and since then has been made a fortress of the first rank. The harbor and fortifications have been built at great cost, as the ground is soft and marshy, and without natural advantages. The harbor basin, which is artificially constructed and walled with granite, is connected with the bay by a canal, and contains three large dry docks; it is defended by forts and provided with a torpedo station. The naval workshops are located here and naval stores are kept here. There is also a commercial harbor connected with the naval harbor, but the town has not yet attained any commercial importance. Pop. about 25,000.

Willibrord, wīl't-brōrd, or **Willibrod**, **Saint**, English missionary, called the apostle of the Frisians: b. Northumbria about 657; d. about 738. He was brought up in St. Wilfred's monastery at Ripon, spent 13 years in Ireland, and at 33 with several associates embarked as a missionary for Friesland, where he was warmly welcomed by the Franconian prince Pepin. Willibrord made two visits to Rome (698 and 699), and on the latter occasion was made bishop by Pope Sergius over all the converted Frisians. In that part of Friesland under the rule of the Franks, he founded many Christian churches, some of which were destroyed a few years later in consequence of the successes of the pagan Frisians. He was buried in the monastery of Echternach, near Treves, and is commemorated in the Roman Catholic Church on 7 November.

Wilkes, wīlks, Charles, American naval officer and explorer: b. New York 1798; d. Washington 8 Feb. 1877. He entered the navy as a midshipman in 1818, served on the Mediterranean Station in 1819-20, in the Pacific, 1821-3, and was then selected for separate command. In 1826 he was promoted lieutenant, and in 1830 was appointed to take charge of the government charts and instruments. In 1838 he was put in command of an expedition for exploring and surveying the Southern seas, the first sci-

tific expedition ever fitted out by the United States government. During the next five years the expedition visited Madeira, Rio de Janeiro, Terra del Fuego, Chile, Peru, the Paumotu group, Tahiti, Tutuila and the Samoan group, New South Wales, the Antarctic regions, New Zealand, the Fiji group, the Sandwich (Hawaiian) Islands, the Columbia River, Willamette Valley, the coast of California, the Philippine Islands, Sulu archipelago, Saint Helena, Singapore, and the Polynesian Islands. The results of the expedition were published in 19 Volumes, those on 'Hydrography' and 'Meteorology' being written by Wilkes himself, who also wrote the 'Narrative of the United States Exploring Expedition' (1845). Wilkes claimed to have discovered an Antarctic continent, but the claim has been disputed. In 1843 he was made commander, in 1855 a captain, and at the beginning of the Civil War in 1861 was placed in command of the San Jacinto, in which he went to the West Indies in search of the Confederate vessel Sumter. On 8 November of that year he took the Confederate commissioners Mason and Slidell from the British mail steamer Trent. (See TRENT AFFAIR, TRE.) In 1862 Wilkes was in command of the Potomac flotilla, and afterward of the flying squadron that operated against blockade-runners. In July 1862 he was promoted commodore, in 1864 was placed on the retired list, and thereon in July 1866 became rear-admiral. Besides those above mentioned his publications are: 'Western America, Including California and Oregon' (1849); and 'The Theory of the Wind' (1855).

Wilkes, John, English politician: b. London 1727; d. December 1797. He was the son of a wealthy distiller, and was educated at the University of Leyden. In 1757 he was returned to Parliament as member for Aylesbury and in 1762 attained considerable reputation by the publication of a paper entitled the 'North Briton,' in which the administration of Lord Bute was severely attacked. These papers hastened the resignation of Lord Bute, April 1763, and the same month the 'North Briton' commented on the king's speech in such caustic terms that a prosecution was determined upon. Wilkes, among others, was apprehended; but he asserted the illegality of the warrant, and refusing to answer interrogatories, was committed to the Tower. Some days after, he was brought by writ of habeas corpus before the court, and was ordered discharged on the ground that his privilege as a member of Parliament had been violated. On the next meeting of Parliament, however, a special law was passed to sanction Wilkes' prosecution, and in January 1764 he was expelled from the House of Commons. A second charge was also brought against him for printing an obscene poem, entitled an 'Essay on Woman,' and he was found guilty of blasphemy as well as libel. As he had by this time withdrawn to France and did not appear to receive sentence, he was outlawed. He made vain attempts to procure the reversal of his outlawry; but trusting to his popularity ventured to return on a change of ministry (1768). He was elected to Parliament for Middlesex, but before he could take his seat was committed to prison to fulfil the sentences previously passed upon him, and not long after was expelled from the House for an alleged libel upon the secretary of state and

secretary at war. Three times after this he was re-elected within a few months, but the House of Commons persisted in keeping him out, and after the third election the other candidate, although he had got but a small minority of the votes, was declared duly returned. In 1770 he was released from his imprisonment. He was now more than ever the idol of the people. He was elected alderman of London, sheriff of Middlesex, and finally mayor (1774). In 1774 he was again elected to Parliament for Middlesex, and allowed to take his seat, which he held till 1790. His last triumph was obtained in 1782, when the resolutions respecting the disputed Middlesex election were ordered to be expunged from the journal of the House of Commons. From the year 1779 he was chamberlain of the city of London. Wilkes, as a writer and speaker, did not reach beyond mediocrity. His private character was very licentious, but he possessed elegant manners, fine taste, ready wit, and pleasing conversation. His 'Letters and Speeches' were published by himself in 1786; and much light is thrown upon his conduct by the 'Letters from the Year 1774 to the Year 1796 to His Daughter' (1894). His correspondence was also published (1895), with a memoir by Almon. Consult: Fitzgerald, 'The Life and Times of John Wilkes, M.P.' (1888).

Wilkes-Barré, Pa., county-seat of Luzerne County, and regarded as the most beautiful town in the State; on the north branch of the Susquehanna River, and on the Central railroad of New Jersey, the Wilkes-Barré and Eastern, the Delaware and Hudson, the Wilkes-Barré and Hazleton, the Delaware, Lackawanna and Western, the Lehigh Valley, the Lackawanna and Wyoming Valley, and the Pennsylvania railroads; 145 miles northwest of Philadelphia, and 176 miles northwest of New York city. It was first settled in 1769 by New England people, mainly from Connecticut, under the auspices of The Susquehanna Company, and was named in honor of John Wilkes and Isaac Barré (q.v.), members of the British Parliament. During the Revolutionary War the settlers were, with few exceptions, loyal to the patriot cause. July 3, 1778, the male inhabitants of Wyoming Valley, who were assembled at Forty Fort to repel an invading foe, were attacked near the fort (on Abraham's Plains, some seven miles from Wilkes-Barré) by a battalion of British Rangers with their Indian allies, and were badly defeated. The Wyoming Monument, erected near the field of battle, commemorates the valor of the Americans who fought on this bloody field. Following the surrender of Forty Fort, on July 4, 1778, Wilkes-Barré was almost wholly destroyed by the enemy. Wilkes-Barré was, in the period of 1769 to 1784, the center of the controversy between Connecticut and Pennsylvania, each State claiming territorial jurisdiction over the Wyoming region (see Pennsylvania: History), and was the scene of several conflicts during that controversy, being almost entirely destroyed by fire at one time in 1784. It was gradually rebuilt and was incorporated as a borough in 1806; its growth has been rapid since the Civil War; and in 1871 it was incorporated as a city. It is situated near the center of Wyoming Valley (q.v.), in the midst of picturesque scenery. Wilkes-Barré is the birth-place of the anthracite coal-mining industry. It was here the dis-

covery was made that there existed on this continent such a mineral as anthracite (or "stone coal" as it was early called). Here anthracite was first used for fires in naileries and blacksmiths' shops; and was thus used for upward of 20 years before the existence of anthracite in any part of Pennsylvania save Wyoming Valley was known. Here anthracite first came into use as a fuel for domestic purposes. Wilkes-Barré lies in the Seventh Anthracite Mining District of Pennsylvania, and from the 37 mines and washeries in operation in the district in 1903 there were produced 4,926,473 long tons of coal. The manufacturing and mechanical industries of the city are also large; the census for 1900 reported 438 establishments, with a combined invested capital of \$10,501,537. Among these, silk and lace mills, axle-works, foundries and machine shops, and wire-rope works are the most important. The city also contains breweries, manufactories of cotton goods, and the Lehigh Valley railroad shops. There are three national banks, and six savings banks and trust companies working under State charters. The city is well built and has a public square containing four acres and a park ("The River Common") containing 35 acres along the river front. In the vicinity of the city are the Wyoming Monument, already mentioned, the old Forty Fort Church, Harvey's Lake (the largest lake in Pennsylvania) and other points of historic interest. The notable public buildings are the city hall, courthouse, jail, post-office, armory of the Ninth Regiment, N. G. P., and Memorial Hall. The city has a number of charitable institutions, including two hospitals—one the City Hospital, and the other Mercy Hospital (under the management of the Roman Catholics); a Home for Friendless Children, and a Home for Homeless Women. It has 20 public school buildings, including the high-school building erected in 1890, in which, in addition to the usual studies, instruction in manual training is given. It has also six Roman Catholic parish schools, and is the seat of Harry Hillman Academy (for boys), the Wilkes-Barré Institute (for girls), the Wilkes-Barré Business College, the New Century School of Correspondence and two Roman Catholic academies for girls—Saint Mary's, connected with Saint Mary's Convent, and Saint Ann's, connected with Malinckrodt Convent. There are two large public libraries—The Osterhout Free Library (having reference and circulating departments), and the reference library of the Wyoming Historical and Geological Society. In addition, the Law and Library Association, the Young Men's Christian Association and other organizations have library collections. The government of the city is vested in a mayor, a select council and a common council; the appointing power rests largely with the mayor. Pop. (1890) 37,718; (1900) 51,721; (1910) 67,105. But, elbowing the city on all its boundaries are boroughs and hamlets, so that, within a radius of nine miles from the center of Wilkes-Barré, there is a population of approximately 200,000.

OSCAR J. HARVEY.

Wilkie, wil'ki, Sir David, Scottish painter: b. Culter, Fifeshire, 18 Nov. 1785; d. at sea, off Gibraltar, 1 June 1841. In 1799 he entered the Trustees' Academy, Edinburgh, where he studied for several years. In 1804 he returned home and painted 'Pittlessie Fair,' the first of that class of works for which he became famous.

In 1805 he went to London, taking with him the 'Village Recruit,' which at length found a purchaser for £6. The Earl of Mansfield purchased his 'Village Politicians,' which at the Royal Academy (1806) excited universal admiration. It was succeeded by the 'Blind Fiddler,' and among the works painted between this period and 1821 may be mentioned the 'Rent Day' (1807); 'Blindman's Buff' (1813); 'Distraint for Rent' (1814); 'The Penny Wedding' (1818); the 'Reading of the Will' (1820); and the 'Chelsea Pensioners,' begun in 1817 and finished in 1821, for the Duke of Wellington. Among the most noted of his later pictures are the 'Entrance of George IV. into Holyrood'; the 'Spanish Council of War'; and the 'Maid of Saragossa.' In 1836 William IV. created him a knight. In 1840 he made a journey to the East, and on the way home was attacked by fever at Malta, and died at sea.

Wilkins, wil'kinz, Mary Eleanor. See FREEMAN, MARY ELEANOR WILKINS.

Wilkinsburg, wil'kinz-bërg, Pa., borough, Allegheny County; on the Pennsylvania Railroad; five miles east of Pittsburgh. It was formerly called McNairville, and Rippeyville, and was given its present name in honor of William Wilkins, secretary of war in 1843-5; it was incorporated as a borough in 1887. Its business interests are identified with those of Pittsburgh, and it is almost entirely a residential town; it contains a national bank with a capital of \$50,000. It is the seat of a home for aged women (Protestant) and of the United Presbyterian Home for the Aged; and there is a high school, established in 1898. Pop. (1910) 18,924.

Wilkinson, wil'kin-son, Henry Spencer, English author: b. Manchester, England, 1 May 1853. He was educated at Owens College, Manchester, and at Merton College, Oxford, and in 1880 was called to the bar. He was on the staff of the *Manchester Guardian*, 1883-92, and since 1895 has been on the staff of the *London Morning Post*. His writings include: 'Essays Toward the Improvement of the Volunteer Forces' (1886); 'The Brain of an Army' (1890); 'The Great Alternative, a Plea for a National Policy' (1894); 'The Nation's Awakening' (1896); 'British Policy in South Africa' (1899); 'War and Policy' (1900); 'The Nation's Need, Chapters on Education' (edited, 1903); etc.

Wilkinson, James, American soldier: b. Benedict, Md., 1757; d. near City of Mexico 28 Dec. 1825. He studied medicine in Philadelphia, and in 1775 enlisted in Washington's army. He became intimate with Benedict Arnold and Aaron Burr, and, having received a captain's commission, joined Arnold's expedition to Canada. He was later appointed to the staff of Gen. Gates, was promoted colonel, and subsequently became deputy adjutant-general of the Army of the Northern Department. In the Saratoga campaign he appropriated as his own the information of the British position and strength which had been secured by Col. John Hardin, and after the surrender of Burgoyne was commissioned to bear the news to Congress, carrying with him also the recommendation of Gates that he be appointed brigadier-general. He was 16 days in making the journey, and the news was a week old when he delivered his

WILKINSON

message. Congress refused to grant his promotion at that time, but a few weeks later, through the influence of Gates, he was brevetted brigadier-general and subsequently was appointed secretary of the Board of War, of which Gates was also a member. He was deeply implicated in the Conway Cabal (q.v.), which his indiscretion betrayed, and was then forced to resign his brevet rank, though retaining his colonelcy. He took no further active share in the war until 1779, when he was appointed clothier-general, an office which he resigned in 1781. He removed to Kentucky in 1784, and in 1786 founded Frankfort. He gained considerable political influence there, intrigued with the Spanish government, with the hope of forming of the Western country a separate republic under the protection of Spain. His reward for this betrayal of his country was to be the exclusive control of commerce on the Mississippi and a yearly pension from the Spanish government. The plot was to be consummated at the convention which met in 1788 for the purpose of forming a constitution for the new State of Kentucky. Wilkinson's influence, however, proved insufficient, and the plot, becoming known to other leaders, fell through. The part of Wilkinson remained a secret, and though he continued to receive his pension from the Spanish government until 1800, he applied in 1791 for service in the army. His treasonable act not being known, he was appointed lieutenant-colonel, served in the Indian wars of the West, and was prominent in Anthony Wayne's campaign. He was promoted brigadier-general in 1792, and in 1796 succeeded Wayne in the command of the army. After the acquisition of Louisiana he was appointed in 1805 governor of the Territory of Louisiana and in this position engaged with Aaron Burr (q.v.) in the latter's scheme for founding an empire in Mexico. In 1806 Wilkinson, perceiving an opportunity to drive a double bargain, betrayed the scheme to the President, and at the same time demanded from the viceroy of Mexico a reward for saving that kingdom to Spain. The assertions of Burr as to Wilkinson's complicity in the plot were generally believed, but at that time no proof of his guilt was obtainable, though he barely escaped indictment on the same charge with Burr in 1807. Inquiry concerning his pension from the Spanish government was made in that year upon a resolution of John Randolph, but he was exonerated. Charges were again made against him in 1810 on the score of complicity with Burr and of receiving pay from the Spanish government, but he was finally acquitted in December 1811, and resumed command in the army. He was promoted major-general during the War of 1812, and commanded the Canada Expedition, but proved incompetent and in 1814 was superseded. He was court-martialed in that year on several serious charges—neglect of duty, conduct unbecoming an officer, drunkenness, etc.—but in 1815 was acquitted and honorably discharged from the army. He then removed to the City of Mexico, where he spent the remainder of his life. He published: 'The Aaron Burr Conspiracy Exposed' (1808); and 'Memoirs of My Own Times' (1816). Consult: Clark, 'Proofs of the Corruption of Gen. James Wilkinson' (1809); Gayarré, 'Spanish Dominion in Louisiana' (1854); Gilmore, 'Advance-Guard of

Western Civilization' (1887); Roosevelt, 'Winning of the West,' Vol. III. (1894); Green, 'The Spanish Conspiracy' (1891); McCaleb, 'The Aaron Burr Conspiracy' (1903).

Wilkinson, *Jemima*, American religious visionary. b. Cumberland, R. I., 1753; d. Jerusalem, Yates County, N. Y., 1 July 1819. She was educated as a Quaker and at 20, after a severe attack of fever, she professed that she had been raised from the dead, that her carnal life was ended, and that henceforth her body was reanimated by the spirit and power of Christ. She pretended to work miracles, and, though entirely illiterate, induced many intelligent people to become her followers, her attractive person and extraordinary tact and shrewdness aiding her in maintaining the imposture. In 1786, at a meeting of her disciples, it was resolved to found a colony in Yates County, N. Y., in the present town of Torrey. The next year 25 of her followers went to the new purchase, and prepared the land for wheat. In 1789 two of the number purchased 14,000 acres of land in that vicinity, to which was afterward added the township of Jerusalem. The same year Jemima and a large number of her followers came, and a house was erected for her. She had taken the name of the "universal friend," and assumed a costume which belonged about equally to either sex, as she asserted that in her spiritual body there was no sex. She was accompanied by two "witnesses," Sarah Richards and Rachael Miller. She exacted from her followers the most complete submission and the most menial services, her influence over them being practically supreme. A farm of 1,000 acres was set apart for her special use, and cultivated freely by her followers. She insisted on the Shaker doctrine of celibacy, and the exercises at her religious meetings resembled those of that sect. She never relinquished her pretensions, but after some years her influence waned, and the latter part of her life was embittered by jealousies and annoyances which she bore with no great fortitude. After her death the sect was entirely broken up. Consult: Hudson, 'Jemima Wilkinson, a Preacheress of the 18th Century' (1841); 'Memoir of Jemima Wilkinson' (Bath, N. Y., 1844).

Wilkinson, *Sir John Gardner*, English archaeologist: b. Haxendale, Westmoreland, 5 Oct. 1797; d. Llandover, Caermarthenshire, 29 Oct. 1875. He was educated at Harrow and Oxford, and after leaving Oxford lived in Egypt 1821-33, during his stay making a thorough study of the ancient monuments of that country as well as of the languages and manners of the modern inhabitants. The most important fruit of his labors was a work entitled 'Manners and Customs of the Ancient Egyptians Derived from a Comparison of the Painting, Sculpture, and Monuments Still Existing, with the Accounts of Ancient Authors' (1837-41), which still remains a standard authority on all that relates to Egyptian art. His later works about Egypt are of a more popular character. Among them are 'Modern Egypt and Thebes' (1833), afterward abridged and published as a 'Handbook for Travelers in Modern Egypt' (1847); 'A Popular Account of the Ancient Egyptians' (1853); and 'The Egyptians under the Pharaohs' (1851), forming a supplement to the previous work. His principal other

works are 'Dalmatia and Montenegro' (1848); and 'Color, and the Necessity of a General Diffusion of Taste Among All Classes' (1858). He was knighted in 1839. The collections made by him were given in part to the British Museum, but a considerable proportion of them was presented to Harrow.

Wilkinson, William Cleaver, American educator: b. Westford, Vt., 19 Oct. 1833. He was graduated from the University of Rochester in 1857, was ordained in the Baptist ministry in 1859, and in 1859-61 was pastor of the Second Baptist Church, New Haven, Conn. He was professor *ad interim* of modern languages at the University of Rochester in 1863-4, and was engaged in pastoral work at Cincinnati, 1863-6. He was professor of homiletics and pastoral theology at the Rochester Theological Seminary in 1872-81, was engaged in literary work in 1873-92, and has since been professor of poetry and criticism at the University of Chicago. He is counsellor of the Chautauque Literary and Scientific Circle and has published: 'The Dance of Modern Society' (1866); 'A Free Lance in the Field of Life and Letters' (1874); 'The Baptist Principle' (1881); 'Poema' (1883); 'Edwin Arnold as Poetizer and Paganizer' (1885); 'Classic German Course in English' (1887); 'The Epic of Saul' (1891); 'The Epic of Paul' (1898); 'The Epic of Moses' (1903); etc.

Wilkinsoniana. See **Religious Sects**.

Will. It has been usual to classify mental phenomena under the three headings of cognition, feeling, and will or conation. In the last class are included all those processes in which the mind is regarded as effecting some change in its own states, or in the physical environment by means of bodily movements. These changes may take place in a more or less clearly conscious way: that is, in producing changes by means of inner or outer acts of will, we may be more or less explicitly aware of the nature of the result to be attained, and of other possible lines of action. It is an essential characteristic of the states that we name impulses or instincts that they are not deliberative. These processes, however, as expressions of the appetitive or active powers of the mind, are conative in character. Automatic or reflex acts, on the other hand, being brought about without any mediation of consciousness, cannot be regarded as belonging to will at all. In impulse the act is initiated by a feeling of uneasiness or craving which has a tendency to discharge immediately in some movement to relieve this feeling. It is from such immediate and impulsive reactions of consciousness that those more explicit and conscious processes that we call voluntary acts develop. We are not born with the power of performing voluntary acts, but this is a progressive acquirement that presupposes an experience of the results of involuntary acts, and the means of obtaining or avoiding these results. The development of will, in the true sense in which it is an endowment that belongs only to rational beings, as it passes from the stage of impulse and instinct, involves a growing consciousness of the relative value of various ends, and also of the means that may be used for the realization of these ends. The development of will is thus only possible through the development of the mind as a whole. Moreover,

it is to be noted that this development implies further the systematic integration and union of the rational and emotional sides of mind with its active or conative aspect. As mind develops, all of its functions become more closely and organically connected.

What has just been said may serve to show the fallacy in the view of the older psychology which regarded will as a distinct faculty, opposed, as if it were a separate department, to feeling and cognition. It was too often forgotten in making this division that these faculties were not each *sui generis*, and that the so-called "faculty" is only an abstraction if thought of as a kind of entity apart from the concrete processes of consciousness. Moreover, the emotional and cognitive states of mind do not exist in separation from the conative aspect, but the latter is necessarily implicated and involved in them. It has been one of the most important achievements of recent psychological analysis to exhibit the presence of will in various intellectual processes, like perception, association, and thinking, in the form of the selective activity of attention. The true view then is that cognition, feeling, and conation are "moments" or "aspects" of mind that can be distinguished by analysis, but which exist and function concretely only in relation to each other. At the present time, psychologists are not agreed as to whether it is possible to discover by analysis any definite conative process as a structural element in conscious life, corresponding to the elementary sensations or feelings. The reality and functional efficiency of the will is not really at stake in this question, however, as has been too hastily assumed by certain representatives of both parties to the dispute. Even if it is found that the processes of will cannot be isolated as separate and distinct states of mind, there will be no ground for denying the real activity of the subject. The truth seems to the present writer to be that will cannot properly be represented in the form of one particular kind of mental content, just because it is the expression of the attitude of the self toward all mental content.

We have seen that those processes of fully explicit will that we term voluntary acts are always accompanied by a somewhat clear consciousness of the end to be realized, and of the relation of means to this end. Moreover, in a fully deliberative act of will, there is also a recognition of various competing possibilities and a conscious selection of one to the exclusion of the others. Instead of allowing an impulse to pass at once into action in accordance with the immediate demands of some single want or uneasiness, in voluntary states consciousness takes control, looking before and after and comparing the consequences of different lines of action. In many cases its efficiency and control are shown by checking or inhibiting the immediate impulse by the thought of some more valuable end with which it conflicts.

How are such volitions to be described psychologically? What actually goes on when a decision is voluntarily made? If we leave out of account the various sensations of muscular strain that accompany volitions, we may say that the essence of the act consists in fixing one alternative and holding it fast before us by means of selective attention. This attention is not passively determined by the greater intensity or immediate attractiveness of one object, but is

the result of the fullest activity of the subject, and is at once a psychological fact and a moving force in the external world. As Prof. James remarks: "We do not first have a sensation or thought, and then have to add something to it to get a movement. Movement is the natural immediate effect of feeling, irrespective of what the quality of the feeling may be. It is so in reflex action, it is so in emotional expression, it is so in voluntary life."

The Freedom of the Will—The vexed problem of the freedom of the will arises from the fact that there seems to be an antagonism between the demands of our intellect and those of our moral nature. On the one hand, there is the requirement that all phenomena of the inner life, like those of external nature, shall be capable of explanation according to the law of cause and effect. On the other hand, it is maintained that if morality is to have any meaning, the individual must be free and thus responsible for his acts. In favor of determinism, it is argued that the mental life is composed of a series of states or processes that are related to each other causally just as are events in the external world; this is the necessary assumption of psychology and of all the sciences that attempt to explain the mental life. "Whenever determination by necessary laws ceases, there ceases also the possibility of any explanation." Moreover, determinists point out that the individual is moved to act by certain motives, and that these motives are the resultant of certain external influences as modified by his character. This character again is the product of previous acts, either of his own or of his ancestors, so that at any time the act performed is the necessary reaction of the individual in the given circumstances. Furthermore, it is maintained that there is an unbroken line between acts that are performed from instinct or impulse, and where consequently there can be no claim made for freedom, and the most complicated and deliberate acts of will. On the other side, those who contend for freedom argue that we have no right to consider the mind of man as simply a part of nature and subject like it to necessary laws of causation. They urge in support of their position that personality, the principle of intelligence itself, cannot properly be represented as one factor on a level with others, but that it is the centre from which the very conception of law springs, and on another side is the determining ground of all motives, and furnishes the standard by which they are evaluated. Appeal is also made to the immediate conviction of freedom that is present in all genuine cases of willing. Further, it is said that it is only on the assumption of freedom that such terms as "responsibility," "duty," "obligation," and "remorse" have any meaning. He who denies freedom, then, declares the experiences denoted by these words to be illusory.

It is impossible to give in the present article a detailed examination of these arguments. A few remarks may, however, be added regarding the general nature of the problem and the lines along which a reconciliation may be effected. In the first place, it is obvious that this controversy is a special phase of the general problem of mechanism (q.v.) and teleology (q.v.). Is everything to be explained according to necessary laws of cause and effect, or is it possible without doing violence to this principle to main-

tain a determination according to ends? If it is possible for the individual to set before himself the ends of his life, and to work for their realization, he is free in the only sense in which the word has any meaning. If, however, his acts are determined by some force that acts independently of him, he cannot be held responsible. Again, determinism is the only standpoint from which psychology as a natural science can proceed. For this science views the mental life as made up of a series of processes or mental phenomena. Its task, therefore, is to discover how these various elements are linked together according to causal laws. From the very nature of its postulates it is impossible to admit that there is any break in the line of causes and effects: every "state of mind" must be explained by showing that it stands in necessary relations to some other phenomena belonging to the same series. But this is to look at the mind from the outside, as composed of a number of phenomena, or mere occurrences in time. It is, however, possible to describe mind in a way that is truer to the direct experience of life, as a system of conscious functions or acts in which purposes are being realized and ends attained through the self-directed activity of the subject. As soon as this point of view is taken the causal and deterministic position is left behind, and the only possible assumption is that of self-determination or freedom. The conclusion we have reached then is that, so long as we regard mind from the standpoint of psychology as a science, everything must be explained causally, and that there is no possibility of introducing here the conception of freedom. But we have also seen that this standpoint is not final, but that experience can be more adequately interpreted as a process in which a conscious subject realizes ends that he himself sets, and that this view necessarily regards mind as something more than a series of causally determined phenomena.

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Will, in law, is a disposition made by a competent person known as the testator in a form prescribed by law, of property over which he has legal power of disposition, to take effect at death. Technically, the term "Will" is used to describe an instrument which disposes of real property, while "Testament" is used to describe one that disposes of personal property, "Will and Testament" including both. Broadly, and by common use, the term "Will" covers both meanings and is accepted as describing an instrument that disposes of both realty and personalty. Any person of legal age, being of sound mind and memory and not under duress, may make a will disposing of whatever interest he has at his death in either real or personal property. All wills to be valid, with the exception of a favored class known as "Nuncupative

Wills which are oral, must be written and signed by the testator and witnessed by at least two persons who must sign in the presence of the testator and of each other, and are not beneficiaries under the will. Oral wills are permitted in the case of soldiers and sailors in actual service, and these "nuncupative" wills are definite statements of the will of the maker with two or more witnesses, who shall within a reasonable time thereafter reduce the statement to writing and sign as witnesses. A beneficiary cannot be a competent witness to a nuncupative will. A will may be altered or amended by the addition of the further wish of the testator, the amendment being known as a "Codicil," which must be signed by the testator and witnessed with the same formality as the original will. A will may be revoked by the testator by destroying it, such as by canceling, tearing, burning, or otherwise mutilating it, or by making a new will, which later will invalidates all preceding wills. The destruction of a later will revives a former will, which will then have full effect. In some States the subsequent marriage of the testator invalidates a will. The laws of the different States vary as to the provisions for the heirs and next of kin.

A will may be written in any language that expresses the intention of the testator. It need not be written in any prescribed form, but must show the intention. It may be written in any form of writing material or on several pieces of paper if their sense shows them to be connected each to the other. Separate documents may be included in the will if the will speaks of their incorporation in the will as a part of it, and in such a way as to identify the documents. Publication is the act of making known in the presence of witnesses that the instrument executed is the will of the testator. It is not necessary for the witnesses to know the contents of the will, but the fact that it is the will. Publication is not necessary in all States. A will usually names one or more persons who shall carry out the will of the testator. This person is known as the executor. When no person is named in the will the court appoints such person, who is known as the administrator. At the death of the testator the will is placed on file for probate in the probate or surrogate court. A will is construed liberally, the words taken in their plain and usual sense, and the intention of the testator allowed to prevail wherever possible to understand such intention. Effect is given to every part of a will. Rules of construction are valuable only in case the will is contested. Favor is shown in case of contest to natural heirs and next of kin. Conditions may be made, and trust estates created, and whatever interest the testator may have at death may be disposed of by will during his lifetime to take effect at death. When a testator has a large estate it is customary to have his will drawn up by an attorney who is familiar with rules of construction and of evidence. This is not necessary to the validity of a will, which may be written by any one so long as it is properly signed and witnessed.

Will-o'-the-wisp. See **LOUIS FATOUS**.

Willamette, wil-lá'mét, a river in Oregon which has its rise in Lane County, flows nearly north and enters the Columbia River in Columbia County, in the northwestern part of the

State. The total length is about 200 miles. It is navigable for large steamers to Portland (q.v.), 15 miles from its mouth.

Willard, will'ard, Ashton Rollins, American art critic: b. Montpelier, Vt., 14 April 1858. He was graduated from Dartmouth in 1879, removed to Boston in 1887, and has since spent much time in Europe. In 1902 was made chevalier of the Order of the Crown of Italy. His writings include: 'Life and Work of Painter Domenico Morelli' (1895); 'History of Modern Italian Art' (1898); 'Land of the Latins' (1902); etc.

Willard, Edward S., English actor: b. Brighton, Sussex, 1853. His first appearance on the stage was made at Weymouth in 1869, but his London debut was not made until 1881. He became manager of the Shaftesbury Theatre in 1889 and in 1890 came to the United States, where he played successfully for three years. He leased the Comedy and Garrick Theatres in London in 1894 and has since made several tours of the United States, playing various leading parts under his own management.

Willard, Emma Hart, American educator: b. Berlin, Conn., 23 Feb. 1787; d. Troy, N. Y., 15 April 1870. She began her career as a teacher in 1803, subsequently became principal of a girls' academy at Middlebury, Vt., and in 1809 was married to Dr. John Willard. She opened at her home in Middlebury, Vt., in 1814, a boarding school for girls in which she introduced various improvements in methods of instruction and also taught subjects hitherto not included in the curriculum of girls' schools. Desiring a broader field for the development of her ideas of education she addressed to the New York Legislature in 1819 a treatise entitled 'A Plan for Improving Female Education'. It was an able exposition of excellent ideas and found favor with Gov. John Clinton, resulting in the establishment in that year of a seminary for girls at Waterford, N. Y., which was incorporated and was partially supported by the State. She removed to Troy in 1823 where she was presented by the city with a suitable building for her school, henceforth known as the Troy Female Seminary. After the death of her husband in 1825 she conducted the business management of the school in addition to her other work until 1838, when she resigned her duties into the hands of her son. She traveled in Europe in 1830, assisted in founding a school for girls in Athens, Greece, and afterward published 'Journal and Letters from France and Great Britain' (1833), the proceeds of which she presented to the school. She was married to Dr. Christopher C. Yates in 1838, but in 1843 she secured a divorce from him and resumed her former name. She traveled 8,000 miles through the Southern States in 1846 engaged in lecturing before conventions of teachers, and in 1854 was present at the World's Educational Convention in London. Mrs. Willard is one of the most prominent figures in the history of higher education for women in the United States. She was not only an advocate of advancement but a practical worker for it, and brought to her task great earnestness of purpose, coupled with high abilities and executive capacity. Her school-books were widely used and were translated into European and Asiatic languages. They include: 'The Wood-

bridge and Willard Geographies and Atlases' (1823); 'History of the United States' (1828); 'Treatise on the Circulation of the Blood' (1846); 'Last Leaves of American History' (1849); 'Astronomy' (1853); 'Morals for the Young' (1857); etc. She also wrote some excellent verse, which includes the famous 'Rocked in the Cradle of the Deep.' A statue was unveiled to her memory at Troy in 1895. Consult John Lord, 'Life of Emma Willard' (1874).

Willard, Frances Elizabeth, American educator and temperance reformer. b. Churchville, N. Y., 28 Sept. 1839, d. New York 18 Feb. 1898. She was graduated from the Northwestern Female College, Evanston, Ill., in 1859, engaged in teaching, was appointed professor of esthetics in the Northwestern University in 1869, and became dean of the Women's College of that institution in 1871. In 1874 she resigned this position, was elected secretary of the Woman's Christian Temperance Union in that year, and in 1879 she became its president, an office she held until her death. In her management of the association she displayed great executive ability and a remarkable genius for organization. She founded in 1883 the World's Christian Temperance Union, and in 1888 became its president. She declared herself in favor of woman's suffrage in 1876 and thereafter lectured occasionally upon the subject, deeming the ballot a protection to women from the miseries caused by drink. In 1892 she visited England, where she was the guest of Lady Henry Somerset, the temperance reformer, and while there addressed a mass meeting at Exeter Hall, said to have been one of the largest assemblages ever held there. In her work Miss Willard displayed an untiring energy, and for 10 years she averaged a meeting a day, meanwhile continuing her literary labors. She was editor of the *Chicago Post and Mail* for a short time after 1878, and from 1892-8 editor-in-chief of the 'Union Signal,' the official organ of the temperance movement. Her publications include: 'Nineteen Beautiful Years' (1868); 'Woman and Temperance' (1883); 'Glimpses of Fifty Years' (1889); 'A Great Mother' (1894); etc. She also edited with Mary A. Livermore, 'A Woman of the Century' (1893).

Willard, Josiah Flynt, American author and sociologist: b. Appleton, Wis., 23 Jan. 1869; d. Chicago, Ill., 20 Jan. 1907. While studying at the University of Berlin in 1890-5 he became interested in sociological problems, and was impressed with the danger impending to the United States through its being a haven of refuge for European criminals when their own country would no longer suffer their being at liberty. In order thoroughly to understand the situation and the actual conditions and feelings governing the tramp world he led for several years the life of a vagrant, publishing the results of his observations in 'Tramping with Tramps' (1899). His other writings include: 'Powers that Prey' with F. Walton (1900); 'Notes of an Itinerant Policeman' (1900); 'The World of Graft' (1901); 'The Little Brother' (1902); 'The Rise of Roderick Cloud' (1903); etc.

Willard, Samuel, American clergyman, scholar, and educator: b. Concord, Mass., 31 Jan. 1640; d. Boston, Mass., 12 Sept. 1707. Graduated from Harvard in 1659, he studied

theology, and in 1663 was ordained minister at Groton, Mass. This village having been destroyed by the Indians (1676) during King Philip's war, he removed to Boston, where he was made colleague of Thomas Thacher, pastor of Old South, and upon the latter's death (15 Oct. 1678) succeeded to the pastorate, which he held until his death. In 1700 he became vice-president of Harvard, and in 1701, upon the resignation of President Increase Mather (q.v.) (6 Sept.), assumed the direction of the institution. He retained the active pastorate of the South Church, however, and by order of the General Court was debarred from the title of president. He was opposed to the persecutions for witchcraft, and wrote and spoke against the delusion. In 1688 he began to give a series of Tuesday afternoon lectures on theology, and these he continued for the rest of his life. The lectures were printed in 1726 in a folio of 914 double-columned pages. 'The thought and expression of this literary mammoth,' says Tyler, "are lucid, firm, and close." Willard published numerous sermons and other writings.

Willard School, The Emma. The Emma Willard School, which in 1904 entered on its 91st year, is one of the oldest institutions for the higher education of women in the United States. It is the outgrowth of an institution founded by Mrs. Emma Willard in Middlebury, Vt., in 1814.

In 1819, the patrons of Waterford, N. Y., urged removal of the school to that place, believing the richer State of New York would grant it an appropriation. The legislature did not grant an endowment, but the application led to the allowing of a portion of the literature fund for girls' schools, to be given to the school, the first legislative appropriation of money for the education of girls.

In 1821, Mrs. Willard accepted an invitation from the citizens of Troy to remove the seminary to that city, where the school became known as the Troy Female Seminary. From the establishment of the seminary in Troy in 1821, to 1875, more than 15,000 pupils were connected with the school. In 1892, a complete reorganization of the course of study was made, the art department was introduced, the boarding department was opened in Russell Sage Hall, and the old name gave way to that of Emma Willard School, thus bringing the school into close touch with its famous past and associating it in name with its illustrious founder.

The school is situated in Troy, N. Y., on the Hudson River, a city of about 80,000 inhabitants. Troy has a healthful climate, being surrounded with attractive open country which can be reached easily. It is within a few hours' journey of many noted health resorts, and places of natural and historic interest; among which are the Green Mountains, the Catskills, the Berkshires, Lake George, Bennington, and Saratoga. Excursions to some of these places can be taken in the spring and autumn if desired. Troy is an important railway centre, and is easily accessible from many directions, by various lines of railroad. Advantages of New York are available during vacations, for students, if desired by parents or guardians.

The school now occupies, in addition to the former residence of Mrs. Emma Willard, three new beautiful buildings erected for its use.

Russell Sage Hall, the gift of the Hon. Rus-

sell Sage, whose wife is the efficient president of the Emma Willard Association, is the residence for members of the faculty and for boarding pupils. The building consists of five stories above the basement. It is fire-proof in construction, all floors having steel beams with a filling of fire-proof material, and all dividing walls and partitions being of brick or hollow tiles.

The Gurley Memorial Hall contains the assembly room, recitation rooms, gymnasium, laboratories, library, and offices. It is a two-story basement structure, having a central section and two wings, built of granite with Long Meadow brown-stone trimmings, and has a handsome appearance from every point of view. This building is also fire-proof, all of the floors are laid upon brick, supported by iron beams, and the plastering and ceiling are applied directly to the brick without lath. The rooms are spacious, with high ceilings, are well lighted and are handsomely furnished.

The library contains over 2,000 volumes, and is open daily for the use of faculty and students. The Troy Public Library, with more than 40,000 volumes, is situated directly opposite the school.

The Anna M. Plum Memorial building, the gift of Mrs. G. V. S. Quackenbush, in memory of her daughter, Miss Anna M. Plum, a graduate of the school, contains the studios and offices for the departments of music and art. It has three stories, and is built of granite with brown-stone trimmings.

The government of the school, and its underlying idea, is mutual good, understanding and sympathy between teacher and pupil. There are few regulations to be enforced, for it is taken for granted that girls entering the school are ladies and mean to do right. The design is to combine thorough scholarship with culture, and the oversight and care exerted are given as a help and guidance in developing self-respect and self-control.

The school is undenominational, but positively Christian in its influence. Regular attendance at church is expected, and students are permitted, under charge of some teacher, to attend any church preferred by their parents.

W. F. GURLEY,

President Board of Trustees.

Willcox, wil'kōks, Orlando Bolivar, American soldier. b. Detroit, Mich., 16 April 1823; d. Coburg, Ont., 10 May 1907. He graduated from West Point in 1847, served in the Mexican war and later in the Seminole war, and other Indian campaigns. He was promoted lieutenant in 1850 and in 1857 resigned from the army, thereafter engaging in law practice at Detroit until the outbreak of the Civil War, when he re-entered the army as colonel of volunteers. He was engaged at the capture of Alexandria, and at the first battle of Bull Run was wounded and taken prisoner. He was exchanged in 1862 and afterward participated in the battles at South Mountain, Antietam, and Fredericksburg, led a division at the battle of the Wilderness and in the Richmond campaign, and in 1864 was brevetted major-general of volunteers. He was the first to enter Petersburg, receiving its surrender, and in 1866 was mustered out of service. He re-entered the regular army with rank as colonel in 1866, was bre-

vetted brigadier-general and major-general in the regular army in 1867 for services at Petersburg and Spotsylvania, and was voted a Congressional medal of honor for gallantry at Bull Run in 1861. He received full rank as brigadier-general in 1886 and in the following year was retired. He wrote: 'Shoepac Recollections by Walter March' (1856); and 'Facts An Army Memoir, by Major March' (1857).

Willemite, an important ore of zinc and a mineral of much mineralogical interest. It is essentially a zinc orthosilicate, Zn_2SiO_4 , but all of the many varieties from Franklin Furnace and Ogdensburg, N. J., its two most prolific localities, contain considerable manganese. The colors of the New Jersey willemite are very varied, white, green, yellow, flesh-red, brown and gray, the last three being characteristic of the variety troostite which occurs in crystals up to six inches in length. The crystallization of willemite is rhombohedral, the common form being a hexagonal prism, either stout or much elongated, terminated by obtuse rhombohedrons. It occurs in small crystals of prismatic or obtuse rhombohedral habit in New Mexico. A granular form is also found in New Jersey in large quantities, intimately mixed with franklinite. Crystals from Belgium have an easy basal cleavage, but this cleavage is difficult in New Jersey crystals, which have eminent prismatic cleavage. The mineral has a hardness of 5.5 and a specific gravity of 3.9 to 4.2. Transparent crystals and masses have been found in New Jersey which yield gems whose beauty is much enhanced by the strong double refraction of the mineral, though the inferior hardness precludes their use as jewels. Ordinarily willemite is opaque, but with transparent portions scattered through the mass. The green phosphorescence of willemite when struck with a hammer has been known for many years. During exposure to the Röntgen rays and to the ultra-violet and other rays of the Piffard lamp a gorgeous green fluorescence is observed in the New Jersey mineral and some specimens are also highly phosphorescent, but these properties are not possessed by willemite from other localities. Radium salts excite instant luminescence in the New Jersey mineral. These observations have attracted widespread interest.

Willems, vil'lēmz, Florent, Belgian artist: b. Liège, Belgium, 9 Jan. 1823; d. Neuilly, France, 22 Oct. 1905. He studied at the Academy of Mechlin and formed his style upon that of the old Dutch masters. He removed to Paris in 1844 and was awarded first-class medals in 1855, 1867, and 1878. His work has been well received in the United States and examples of it are included in many private collections. Especially good canvases by him may be seen at the Metropolitan Museum of Art in New York, and at the Art Institute of Chicago.

Willems, Jan Frans, Flemish philologist: b. Bouchout, near Antwerp, Belgium, 11 March 1793; d. Ghent 14 June 1846. In 1809 he was placed in the office of an Antwerp notary, and in 1811 won a prize for the best poem on the battle of Friedland and peace of Tilsit (1811). His ode, 'Aen de Belgen' ('To the Belgians,' 1818), hailing the revival of Belgian nationality under Holland's protection, brought him a position under the Dutch government and a series of masterly philological works, including

'Over de Nederduitsche Taal en Letterkunde' (1819-20), procured him admission to the Academy of Antwerp. On the formal separation of Belgium from Holland in 1830 he was removed from office and settling at Enclou, he labored there on the Flemish version of 'Reynard the Fox,' in his edition of it (1834) calling on Flemings to help to preserve their ancient tongue. As archivist of Ghent from 1835 he edited the 'Rymkronyk van Fan van Helu' (1837), 'Brabantsche Yeesten' (1839-43), etc., and after his death appeared his collection of old Flemish songs, and his 'Mengelingen van Vaderlandschen Inhoud.' Consult lives by Snellaert (1847); Rooses (1874); and Rooses, Buytende, and Bergmann, 'Jan Frans Willem's' (1893).

Willet, an American snipe of the genus *Symphemia*. The bill is thick, compressed, straight, longer than the head; wings long, legs long and strong; tail short and nearly even. The *S. semipalmata* is about 15 inches long and 31 in alar extent, the bill $2\frac{1}{4}$; it is darkly speckled above; rump, upper tail coverts, and under parts white; tail ashy white, the two middle feathers spotted; secondaries white, with brownish black spots. The young are spotted and transversely banded with brownish black. It is found throughout eastern temperate North America, and in South America, rarely going far from shore; on the Pacific it is represented by a distinct subspecies. It goes south in winter as far as the Gulf States where it also breeds sparingly; and is often found in company with the godwits. It breeds in both fresh and salt marshes on the ground and remain in separate flocks during the fall and winter. The eggs and the flesh, especially of the young birds, are excellent eating. The food consists of small crustaceans, and aquatic worms and insects. They are rather shy, rapid and strong fliers, and good swimmers if necessary, though they cannot dive. They are noisy while breeding, the shrill cry being reiterated as long as an intruder remains in sight. The name is derived from the resemblance of their notes to the "will-willet." Owing to their shyness, the keen sight which enables them to detect the sham of decoys, and their swift, often elevated flight they are difficult to shoot, and offer fine sport to the skilful sportsman. For these reasons, and because of their large size and excellent table qualities, they are much sought. Consult Eliot, 'North American Shorebirds' (New York 1895).

Willett, Marinus, American soldier: b. Jamaica, N. Y., 31 July 1740; d. New York 22 Aug. 1830. He served in the French war with rank as lieutenant, was especially prominent in the expedition against Ticonderoga in 1758, and in the capture of Fort Frontenac. He was active in the movements of the Sons of Liberty and on 6 June 1775 took measures to prevent the forwarding of arms from New York to the British troops in Boston Harbor. He served as captain under Montgomery in his expedition against Canada in 1775, remaining in command of the post at Saint John's until January 1776; was second in command at Fort Stanwix in 1777, led and held the fort until relieved by Arnold. In June 1794 accepted a mission to the Creek Indians present at Monmouth, and in 1779 joined the expedition of General Sullivan against the Six

Nations. He commanded the forces in the Mohawk Valley from 1780 until the close of the war, conducting in 1783 the attempted surprise of the garrison at Oswego, which was the last hostile movement against the British. In 1784-92 he was sheriff of New York, and in 1794 accepted a mission to the Creek Indians and succeeded in concluding with them a treaty of peace. He was appointed mayor of New York to succeed De Witt Clinton in 1807, and in 1812 was secretary of a mass meeting which favored military preparations against the British. He left several manuscript journals from which his son, W. M. Willett, prepared 'A Narrative of the Military Actions of Col. Marinus Willett' (1831).

Willett's Point, N. Y., national military reservation on the south shore of East River at its entrance to Long Island Sound. The reservation comprises 136 acres, purchased partially in 1857 and partially in 1863; the construction of a fort was begun here in 1862, but the work was suspended and the fort remains unfinished. After the war, an engineer battalion was ordered here to establish a depot for stores, a station for torpedo experiments, and a school of practice. The post which constitutes one of the defenses of New York harbor is also known as Fort Totten (q.v.).

William I., surnamed the Conqueror, king of England and duke of Normandy: b. Falaise, Normandy, 1027 or 1028; d. Rouen 9 Sept. 1087. He was the natural son of Robert, duke of Normandy, by Arletta, the daughter of a tanner of Falaise, and his father, having no legitimate son, when about to set out on a pilgrimage to Jerusalem, nominated him as his heir. Robert died in 1035, while returning from Palestine; and Normandy fell for time into a condition of anarchy. When William succeeded to the dukedom his vigor and ability soon restored order, and his power increased so much as to excite the jealousy not only of the surrounding nobles, but of his suzerain the king of France. Two combinations were formed against him, and twice his territory was invaded; but he repelled these aggressions, and reduced the French king to the necessity of peace. The opportunity of gaining a wider dominion presented itself on the death of his second cousin, Edward the Confessor, king of England. When this event took place he laid claim to the English crown, alleging that Edward had bequeathed it to him. To enforce his claim he invaded England, and the victory of Senlac or Hastings, in which his rival Harold was killed, ensured his success (1066). On the following Christmas Day William was crowned, after tumultuary election on the part of the English nobles, and took the customary coronation oath. His first measures were mild: he sought to ingratiate himself with his new subjects, preserved his army in strict discipline, confirmed the liberties of London and other cities, and administered justice impartially. On his return to Normandy, however, the English, being treated by the Norman leaders like a conquered people, revolted and a conspiracy was planned for the massacre of all the Normans in the country. On this intelligence William returned, and began with a show of justice by repressing the encroachment of his followers; but on reviving the Danegelt, which had been abolished by Edward the Confessor, the discon-

WILLIAM

ments were renewed. These he repressed with his usual vigor, and a temporary calm succeeded. The resistance of two powerful Saxon nobles, Edwin and Morcar, who had formed an alliance with the kings of Scotland and Denmark, and with the prince of North Wales, soon after drew William to the north, where he obliged Malcolm, king of Scotland, to do homage for Cumberland. From this time he treated the English like a conquered people, multiplied confiscations in every quarter, and forced the native nobility to desert the country in great numbers. In 1069 another formidable insurrection broke out in the north, and at the same time the English resumed arms in the eastern and southern counties. William first opposed the storm in the north, and executed such merciless vengeance in his progress that the whole country between York and Durham was turned into a desert; and above 100,000 of both sexes and all ages are said to have perished. There being now scarcely a landed proprietor who had not incurred the forfeiture of rebellion, he put into execution his plan of introducing a total alteration of the state of English law and property, by dividing all the lands into baronies and adopting the feudal system in regard to land tenure and services. He also reduced the ecclesiastical property to a similar system, and, to prevent resistance from the clergy, expelled most of the English church dignitaries, and placed Normans or other foreigners in their stead, Lanfranc being made archbishop. Still further to humble the English, he caused French to be used in the courts of justice and in law proceedings, and ordered it to form a leading part of instruction in all the schools throughout the realm. In 1076 he received a demand from Pope Gregory VII., requiring him to do homage for his kingdom, and to pay the accustomed tribute from England to the Holy See. William denied the homage; nor would he allow the English prelates to attend a general council summoned by Gregory, but consented to the levy of Peter's pence. Toward the end of his reign he instituted that general survey of the landed property of the kingdom, the record of which still exists under the title of 'Domesday Book' (q.v.). The manner in which he laid waste a large district in Hampshire, where he demolished villages, churches, and convents, and expelled the inhabitants for 30 miles round, merely to form the New Forest for hunting, exhibits his indifference to the suffering of his subjects, as well as his love of the chase, which he further protected by a most severe code of game-laws. In 1087 he went to war with France, whose king had encouraged a rebellion of Norman nobles, entered the French territory, and committed great ravages, but, by the starting of his horse at Mantes, received an injury which caused his death, at the Abbey of St. Gervais, near Rouen (1087). He left three sons—Robert, to whom he bequeathed Normandy; William, who inherited England; Henry, who received only his mother's property, and five daughters. William the Conqueror was the most powerful sovereign of his time. He possessed superior talents, both political and martial, and employed them with remarkable vigor and industry. His passions were, however, strong; his ambition severe and merciless; and his love of sway often led him to dis-

regard all restraints of justice and humanity. Consult: Lappenberg, 'England under the Anglo-Norman Kings,' translated by Thorpe (1857); Palgrave, 'Normandy and England,' Vol. III. (1864); Freeman, 'History of the Norman Conquest of England' (1867-71); Stubbs, 'Constitutional History of England' (1874); Green, 'Conquest of England' (1884); Freeman, 'William the Conqueror' (1888); Round, 'Feudal England' (1895).

William II., surnamed **Rufus**, from his red face, king of England: b. Normandy 1056; d. New Forest, Hampshire, 2 Aug. 1100. He was the third son of William I. and was sent to England by his father the day before the death of the latter with a recommendation to the barons and bishops that he should be the Conqueror's successor. His wishes were respected and William Rufus was crowned at Westminster 26 Sept. 1087. The division of England and Normandy did not, however, please the great barons, who possessed territories in both; and a conspiracy was formed for effecting the deposition of William in favor of his brother Robert; but the conspiracy was repressed with great vigor; the confederate nobles were forced to withdraw to Normandy, and their English estates were confiscated. It is worthy of notice that in this instance a Norman ruler was supported by his English subjects against his Norman ones. Once firmly seated on his throne, William forgot his promises to the English; and the death of Lanfranc, archbishop of Canterbury, freeing him from an authority which he respected, he extended his rapacity to the church, and seized the temporalities of vacant bishoprics and abbeys, to which he delayed appointing successors. In 1090 he made an incursion into Normandy, to retaliate on his brother Robert; but a reconciliation was effected between them. In 1096 Robert mortgaged his dukedom to William for the sum of 10,000 marks to enable him to fit out an expedition and join the crusaders in the Holy Land. William accordingly took possession of Normandy and Maine, although in the case of the latter he was not allowed to do so without a struggle. William Rufus met his death while hunting in the New Forest. His body was found pierced by an arrow, which is generally believed to have been shot, whether accidentally or purposely cannot be said, by a French gentleman named Walter Tyrrel. Tyrrel immediately galloped to the coast, and embarked for France, where he joined the crusaders. The body was interred without ceremony at Winchester. This event took place when the king was in the 44th year of his age, and 13th of his reign. William Rufus possessed vigor, decision, and policy, but was violent, perfidious, and rapacious. Consult Freeman, 'Norman Conquest of England,' Vol. V. (1876), and his 'Reign of William Rufus' (1882).

William III., king of England and hereditary stadtholder of Holland: b. The Hague 4 Nov. 1650; d. Kensington, England, 8 March 1702. He was the son of William II. of Nassau, prince of Orange, and his mother was Henrietta Mary Stuart, daughter of Charles I. of England. Educated by the grand pensionary John De Witt, he gained the love of the people, who in 1672, when Louis XIV. invaded the republic, appointed him at once captain-general, grand-

WILLIAM

admiral, and stadtholder of the United Provinces, after enforcing the abrogation of a resolution which De Witt had got passed in 1667, and which declared that in future no captain-general should at the same time be stadtholder. William's management of the war against France was masterly. In the campaign of 1673 he opened the sluices in the dikes around Amsterdam, inundating the whole of the neighboring district and forcing the French to retire. He was able to keep the enemy in check, and by his policy engaged the empire, Spain, and Brandenburg to take part with Holland, so that at the Peace of Nijmegen in 1678 the integrity of Holland was respected. William's whole policy was directed against Louis XIV., for whom he entertained a personal hatred, and to curb the ambition of the French monarch he instituted the league of Augsburg, July 1686, between the emperor, Spain, Sweden, and Holland, to which Denmark and some German princes also acceded. His wife, Mary, whom he had married in 1677, was the daughter of James II. of England, and presumptive heiress to the throne. Unexpectedly James' second wife gave birth to a son, 10 June 1688, and the greater part of the Parliament and of the nation now feared that the bigoted James would introduce Roman Catholicism as the state religion, and subvert the constitution. Rumor also asserted that the prince was supposititious. The Episcopalians and Presbyterians in England, under these circumstances, united, in order, by the aid of Holland, to give Mary the succession to the throne. William foreseeing that England, by the policy of his father-in-law, would become more and more closely connected with France, joined with the great majority of the British nation; and the pensionary Fagel persuaded the States-General to support him with ships and troops for the preservation of British freedom and the Protestant religion. William arrived suddenly at Torbay, 5 Nov. 1688, with a fleet of 500 sail, ostensibly equipped against France, and with 14,000 troops. Upon his landing a great part of the nobility immediately declared for him; and James' soldiers by degrees went over to him. In December the king fled with his family to France, after which William made his entry into London. The two houses of Parliament in convention now declared that James II. had broken the fundamental compact between the king and the people, and by withdrawing from the kingdom had abdicated the government. On 13 Feb. 1689, Mary was proclaimed queen, and William, her husband, who had meanwhile gone over to the English Church, was proclaimed king. At the same time the declaration or bill of rights settled the limits of the royal power, and the order of succession. Scotland followed England's example; but in Ireland, whither Louis XIV. sent James with an army, the majority of the Roman Catholics maintained the cause of the deposed king. But William's victories over the army of James on the Boyne 1 July 1690, and at Aughrim, 13 July 1691, assisted by the clemency with which he treated the vanquished party, made him master of Ireland. In the war on the Continent he was less successful. At Steinkirk he was defeated by Marshal Luxembourg in 1692, and at Neerwinden by the same general in 1693; but always succeeded in wresting from the French

the fruits of their victories by skilful retreats and marches. Louis was finally compelled to acknowledge him as king of England at the Peace of Ryswick, in 1697. The Parliament insisted at that time on the disbanding of nearly the whole army, deeming a standing army incompatible with the security of the constitution. Soon after, the will of Charles II. of Spain, who had made the grandson of Louis XIV. his heir, induced William to arm all Europe against Louis in the great alliance of The Hague 7 Sept. 1701. But in the midst of these projects he broke his collar-bone by a fall from his horse between Kensington and Hampton Court, 21 Feb. 1702, and died in consequence of the accident. His wife, Mary, had already died childless in 1694. William's manners were too cold and ungracious to allow him to be popular with the English people. Under a reserved exterior he concealed a strong love of renown and power, and to obtain the majority of votes in Parliament made use of bribery. Immersed in politics and war, he had neither leisure nor inclination for literature and art. In conversation he was grave and unattractive; but in business, penetrating, quick, and decided; in danger, undaunted; in difficulties, unshaken; in war, bold without ostentation. Consult: Burnet, 'History of His Own Times'; Trevor, 'Life and Times of William III.' (1835); Macaulay, 'History of England'; Hallam, 'Constitutional History'; Ranke, 'History of England' (1875); Traill, 'William III.' (1888); Hippold, 'William III., Prinz von Oranien, Erbstatthalter von Holland, König von England' (1900).

William IV., king of Great Britain and Ireland, third son of George III.: b. 21 Aug. 1765; d. Windsor 20 June 1837. From 1779 to 1790 he served in the navy, and after quitting active service was raised successively to all the higher grades of naval command, becoming in 1801 admiral of the fleet. In 1789 he was raised to the peerage with the title of Duke of Clarence. He frequently spoke in the House of Lords, and held the office of lord high-admiral (1827-8). He became heir presumptive to the throne in 1827 and succeeded his brother George IV. as king 26 June 1830. On his accession he retained the ministers then in office with assurances of his confidence in their zeal and ability. In the new Parliament, which met in November, the ministry, being left in a minority on a motion of Sir H. Parnell for referring the civil list to a select committee, immediately sent in their resignation; and a Whig administration was formed with Earl Grey at its head. The great events which render his reign memorable are the passage of the reform act, the abolition of slavery in the colonies, and the reform of the poor-laws. William IV. married in July 1818, Adelaide, sister of the Duke of Saxe-Meiningen, by whom he had no surviving children. He had, however, a large family by Mrs. Jordan, the celebrated actress, who was for many years his mistress, while Duke of Clarence. Her liaison with the duke lasted from about 1790 till 1811, when an arrangement was made by which she and her family were provided for. William IV. was succeeded by his niece Victoria. Consult Fitzgerald, 'Life and Times of William IV.' (1884); Walpole, 'History of England from the Conclusion of the Great War in 1815' (1878-86).

WILLIAM

William I., emperor of Germany and 7th king of Prussia: b. Berlin 22 March 1797; d. there 9 March 1888. He was the second son of Frederick William III. and Louisa of Mecklenburg-Strelitz, and from his earliest years was trained in military exercises. In the campaign of 1813-14 he joined the Prussian forces as captain, receiving then, for bravery in the field, the "Cross of St. George" from the Czar Alexander. On the death of his father in 1840 he became heir presumptive to the throne, and received the title of Prince of Prussia. On the outbreak of the revolution in 1848 he quitted Berlin for England, but was soon recalled and in the following year proceeded against the insurgents with military vigor and suppressed the insurrections in Baden and the Palatinate. His brother having become incapable of ruling, William (1857) was appointed regent, and in January 1861 became king, being crowned at Königsberg in October of the same year. With the assistance of Otto von Bismarck (q.v.) as president of the cabinet, and Von Roon as war minister, he demanded from the nation a large scheme of army reform, and his foresight in this matter was justified by the Prussian successes in the war with Denmark (1864), and the complete overthrow of Austria at Sadowa (1866). The latter war had been brought about by the diplomacy of Bismarck, who now proceeded to form a North-German Confederation with King William as its head, and to conclude a treaty of alliance, offensive and defensive, with the South German States. This growing power of Prussia provoked the jealousy of France, and a crisis was reached in the negotiations concerning the Spanish crown. War was proclaimed between Prussia and France (1870), and the South-German States having declared in favor of the former, King William led the combined German forces through the campaign, which resulted in the defeat of Napoleon at Sedan, and finally in the siege and capitulation of Paris. Meanwhile the North-German Parliament, uniting with the German princes, desired the king to become German emperor. This honor he accepted, and he was crowned as Emperor William I. at Versailles on 18 Jan. 1871. After the conclusion of peace with France, and having entered Paris with his army, the emperor returned to Berlin amid great enthusiasm. The latter part of his reign was passed in consolidating the power of the new German empire, and in parliamentary and political conflicts with the Catholic, Liberal, and Socialist parties in the state (See GERMANY.) His life was attempted several times. Among biographies are those of Forbes (1888); G. B. Smith (1887); Strauss (1887); Simon (French, 1887, Eng. trans.); Marcks, 'Kaiser Wilhelm I.' (1899). Consult also Von Sybel, 'Die Begründung des Deutschen Reichs' (1889-94; Eng. translation 1890-2); Malletson, 'Refounding of the German Empire' (1892); Krause, 'Growth of German Unity' (1892); Oncken, 'Das Zeitalter des Kaisers Wilhelm' (1890-2).

William II. (Friedrich Wilhelm Victor Albert), German emperor and king of Prussia, son of Frederick III. and Victoria, Princess Royal of Great Britain, and grandson of William I.: b. Berlin 27 Jan. 1859. At birth he suffered an injury of the left arm which would have disqualified a private person for the army, but

nevertheless he received a thorough military education. In 1869 he was enrolled in the army as 2d lieutenant, in 1874 entered the gymnasium at Cassel, and three years later, as 1st lieutenant, was admitted to the University of Bonn, where he remained until 1879, his principal studies being political science and law. He then entered upon actual military service, to which, after his marriage (27 Feb. 1881) to Princess Victoria of Schleswig-Holstein-Sonderburg-Augustenburg, he devoted himself with all earnestness, and in 1883 became colonel of the Hussars of the Guard. In spite of his physical defect he was now one of the most capable and dashing officers in the army. He also displayed talents in literature and art, which he has pursued in various directions. Strengthened by physical culture and the diversions of hunting and other sports in which he excelled, he came to the throne (15 June 1888) well trained in mind, mured to exacting labors, and filled with self-reliance and enthusiasm. Statecraft he had learned in the school of Bismarck (q.v.), and his political and personal ideals were imbued with veneration for his grandfather, whose conviction of "divine right" he embodied in his own view of the imperial office. His personal aggressiveness and military methods had given rise to popular fear of indiscretions whereby he might endanger the peace of Germany and of the world, but from the first he has vigorously repelled those suspicions of his motives which have led to his designation as the "War-lord," and against which his conduct in the main has thus far been a vindication. During the mortal illness of his father when Crown Prince, William was called upon to repudiate a charge of conspiracy to keep him from the throne. His own behavior in the three months of his father's reign betrayed no want of filial devotion. Upon his accession William at once asserted his ideas of personal rulership, which he has maintained in theory, and in practice has relaxed only in submission to demands of policy. He has actively concerned himself with every department of German life, and his personal sway has been qualified only by the limitations of the constitution and of public opinion. By travel, in which he has visited all the principal capitals of Europe, he has familiarized himself with international affairs, and he is an expert in world-politics. When Moltke died the emperor declared that he had "lost an army," but when he quarreled with Bismarck he showed no misgivings at the loss of the masterful chancellor and reputed creator of the empire, whose retirement he virtually compelled in March 1890. And indeed by this act, cleverly characterized by his critics as "dropping the pilot," he made himself more distinctly master of the ship of state. Since then his able chancellors—Caprivi, Hohenlohe, Bülow—have been compliant to the imperial will. Shortly before Bismarck's death the emperor sought reconciliation, and their friendship was partially restored. In some things, notably in maintaining the Triple Alliance, the emperor has followed the policy of Bismarck. William has measured his strength against all liberalizing parties, and his early solicitude for the laboring classes has latterly seemed lost in his bitter antagonism to socialistic elements. Bismarck's *Kulturkampf* legacy William has sagaciously disposed of through concessions which he has turned to

profit by making an implicit alliance of the Vatican and the German schools in his anti-revolutionary policies, and by remodeling the schools themselves.

With all his alleged autocratic tendencies William has sought above everything the aggrandizement of Germany, her industrial and commercial supremacy, colonial expansion, and primacy among the great Powers. He has extended the imperial influence to Turkey and Asia Minor, and strengthened German interests in the Far East and in Africa and South America. He holds the press to as strict account as he can; the army and navy, which he would make superior to all others, he keeps in strong control; but his attitude at present indicates no menace, rather a promise of protection to the cause of peace, which on more than one occasion he has doubtless aided in preserving. Herein his conduct has been less aggressive than many of the speeches in which he has addressed himself through Germany to the world. He is admittedly a most remarkable figure among the men and rulers of his time, and in his future career the whole world cannot but feel a profound and cordial interest. The sending of his brother, Prince Henry of Prussia, to the United States, in 1902, did much to promote friendly sentiment, and the emperor's good will has been further shown in his gifts to the American people and to American institutions. Consult: Lavisse, 'Trois Empereurs d'Allemagne' (1888); Bigelow, 'The German Emperor' (1889); Frederic, 'The Young Emperor, William II. of Germany' (1891); Meister, 'Kaiser Wilhelm II.' (1894); Lowe, 'The German Emperor, William II.' (1896); also 'The Kaiser's Speeches,' edited by W. von Schierbrand (1903).

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William I., prince of Orange, count of Nassau, surnamed the SILENT: b. Castle of Dillenburg, Nassau, 16 April 1533; d. Delft, Holland, 10 July 1584. He was the eldest son of William, count of Nassau, and Juliana, countess of Stolberg, and was educated in the Roman Catholic faith by Maria, queen of Hungary, sister of Charles V. He spent nine years in attendance on the person of the emperor, who had so high an esteem for his spirit, prudence, and intelligence, that he asked his opinion respecting the most important matters, and when he was but 22 entrusted him with the chief command of the army in the Netherlands, in the absence of Philibert, duke of Savoy. He also recommended him to his successor, Philip II., who, however, regarded him with distrust. As Cardinal Granvella had now the entire confidence of Philip, and Margaret of Parma, who was charged with the government of the Netherlands, was obliged to do whatever Granvella suggested, especially with respect to the introduction of the Spanish inquisition, and the erection of new bishoprics, the Count of Egmont, the Prince of Orange, and the Count of Horn represented to the king in writing, that unless the cardinal were speedily recalled, his violence would drive the country to rebellion. Though Philip looked on this step as treason, he concealed his anger, and recalled the cardinal (1564). After the remonstrance offered in 1566 by 300 noblemen (the Gueux), with Count Louis of Nassau, the brother of William, at their head,

against the introduction of the Inquisition and the establishment of new bishoprics, had been rejected and the Duke of Alva had been appointed governor of the Netherlands, William had a meeting with Egmont, Horn, his brother Louis, and others at Dendermond, to deliberate on the means of averting the threatening danger. The majority advised an armed resistance, but this proposal came to nothing on account of the opposition of the Count of Egmont. The prince, with his family now went to his castle at Dillenburg. Alva arrived in the Netherlands in 1567, and many men of consequence, including Egmont and Horn, were immediately arrested. In the beginning of 1568 he caused the prince and others, who had retired from the country, to be summoned before the Council of Twelve. The prince did not appear, in consequence of which Alva declared him an outlaw, confiscated his property, and removed his son Philip William, from the University of Louvain, and sent him as a hostage to Spain. The Prince of Orange now determined on waging war against Alva. In a document issued in the summer of 1568, and called his 'justification,' he gave the reasons of his conduct and publicly professed the Protestant religion. In consequence of this he received aid in money and troops from several Protestant princes. William now raised an army of 24,000 Germans, who were joined by 4,000 French soldiers, conducted his forces with great skill across the Rhine and Meuse, entered Brabant, and defeated a division of the hostile army, but was unable to bring the Duke of Alva, who threw himself into the fortresses, to an engagement, or to excite the people, who feared the Spaniards, to a general insurrection. His army now dispersed. He then took part in an expedition to France against the Catholic party of the Guises (1569). In France Admiral Coligny had advised him to fit out privateers against the Spanish, and establish himself particularly in Zealand and Holland, from which the Spaniards would hardly be able to drive him. The prince followed this advice, and the privateers made themselves masters, in 1572, of the town and harbor of Briel, on the island of Voorn, and also took Flushing. As Alva's tyranny became more intolerable, and the people were exasperated by new exactions, several cities of Holland, Zealand, Overijssel, and Gelderland publicly declared for the Prince of Orange. Relying on the assistance of France, which Admiral Coligny had promised to obtain for him, William crossed the Rhine, but the news of the massacre of St. Bartholomew, deprived him for the time of all hope of French aid. He then retired into the province of Holland, which steadfastly supported him. He now resumed negotiations with France, and obtained a treaty in which France promised to support him, provided that it should receive the protectorate over all the provinces of the Netherlands, which he succeeded in wresting from the Spaniards. At the end of 1573 Alva was recalled and replaced by Requesens. In 1574 Louis and Henry of Nassau, William's brothers, made an effort to join him, but were totally defeated by Requesens at Mookerheide, near Nijmegen. Both of William's brothers fell on the field of battle. This blow was compensated by the relief of Leyden, at that time hard pressed by the enemy. The raising of the siege of Leyden saved the province of Holland for the time, but



WILLIAM II, EMPEROR OF GERMANY.

WILLIAM

the Spanish were still formidable, and Holland might have been completely crushed had it not been for the death of Requesens, which took place in March 1576. After this event William succeeded in bringing about the so-called pacification of Ghent (8 Nov. 1576), in which nearly all the provinces of the Low Countries united to expel the foreign troops, and promised mutual toleration in matters of religion. The new stadtholder, John of Austria, sought to break the force of the union by granting, in the perpetual edict, almost all the demands of the people (1577), but his conduct soon manifested his insincerity and the states of Antwerp then called the Prince of Orange to their aid. The people received him with acclamations in Brussels, and he was appointed to the rank of lieutenant-general. The war was now renewed, and by the victory at Gemblours in the end of January 1578, the Spaniards recovered their superiority in the Walloon provinces, which were zealously Catholic. In 1579 Don John of Austria died, and the king appointed Alexander Farnese of Parma as his successor. The policy of Farnese succeeded in gaining over to the king the southern provinces, and the prince, therefore, brought the five northern provinces, Holland, Zealand, Utrecht, Gelderland, and Friesland, into closer connection by the union of Utrecht, 23 Jan. 1579, and thus laid the foundation of the republic of the United Netherlands. In 1580 the king, finding it impossible to triumph over William by fair means, put a price upon his head. This step induced the united provinces to renounce their allegiance to Philip, and William was offered the dignity of sovereign count of Holland and Zealand, which he accepted. But the edict of Philip proclaiming a reward for his life was not without effect. In 1582 an attempt was made by a Spaniard named Jaureguoy to assassinate him at Antwerp, and a second attempt, made at Delft on 10 July 1584, by a Burgundian fanatic Balthasar Gerard, succeeded. William of Nassau was four times married. Maurice of Nassau, who distinguished himself as a general in the Thirty Years' war, was one of his sons, and William III. of England, a grandson of his. Consult: Gachard, 'Correspondance de Guillaume le Taciturne' (1847-66); Motley, 'The Rise of the Dutch Republic' (1856); Klose, 'William I. von Oranien' (1864); Juste, 'Guillaume le Taciturne d'après sa Correspondance et ses Papiers d'Etat' (1873); Putnam, 'William the Silent, Founder of the Dutch Republic' (1895); Frederic Harrison, 'William the Silent' (1897).

William I., Frederick, king of the Netherlands, grand duke of Luxemburg, prince of Orange and duke of Nassau: b. The Hague 24 Aug. 1772; d. Berlin 12 Dec. 1843. He was the eldest son of William V., Prince of Orange-Nassau, and was married to Friederike Luise Wilhelmine, daughter of Frederick William II. of Prussia, in 1791. He distinguished himself in the wars with the French republic, and became an exile with his father, the hereditary stadtholder of the Dutch republic, in 1795, and for several years lived at Fulda. After his father's death, in 1806, he succeeded to the duchy of Nassau, and joining the Prussian army against Napoleon was captured at Jena and his possessions confiscated. Released soon after he fought against the French at Wagram. At

the Congress of Vienna the kingdom of the Netherlands was formed, composed of Holland and Belgium, and 16 March 1815, William I. was proclaimed king. His hereditary estates having been given to Prussia and Nassau, he received in exchange the grand duchy of Luxemburg. Belgium was, however, separated from Holland by the revolution of 1830, and as William was unwilling to recognize its existence as an independent state, he became unpopular. He continued to protest up to 1839, and the next year abdicated in favor of his son, retiring to Berlin at the same time with an immense fortune.

William II., Frederick George Louis, king of the Netherlands: b. The Hague 2 Dec. 1792; d. 17 March 1849. He was the eldest son of the preceding. He distinguished himself in the Peninsular war under Lord Wellington, and also commanded the army of the Netherlands at the battle of Waterloo. In 1816 he was married to the grand duchess Anna Paulovna, sister of Alexander I. of Russia. His reign commenced from his father's abdication in 1840, but although he brought order out of the financial chaos caused by his father, he was by nature opposed to political reform. In 1848 events obliged him to consent to an entire reorganization of the government, but his death took place before the new constitution could go into effect.

William III., Alexander Paul Frederick, king of the Netherlands: b. The Hague 19 Feb. 1817; d. Loo 23 Nov. 1890. He was the eldest son of the preceding and his reign was chiefly distinguished by undertakings of internal improvement. Under his rule, the kingdom enjoyed uninterrupted peace, and material prosperity increased. He carried out the parliamentary reforms instituted in 1848 and in 1860 decreed the abolition of slavery in the Dutch West Indies. In 1866 the Dutch province of Limburg, a member of the Germanic Confederation from 1815, was restored to the Netherlands and by the treaty of 11 May 1867, the grand duchy of Luxemburg was declared neutral territory under the sovereignty of the house of Orange-Nassau. While Prince of Orange, he married in 1839, the Princess Sophia Frederica Matilda, daughter of the late King William I. of Wurtemberg. They had two sons, William Nicholas Alexander Frederick Charles Henry, Prince of Orange (b. 4 Sept. 1840; d. 11 June 1879); and William Alexander Charles Henry Frederick (b. 25 Aug. 1851; d. 21 June 1884), the last male heir of the house of Orange. In 1879 King William was married to Emma, Princess of Waldeck-Pyrmont, their daughter Wilhelmina becoming heir to the throne.

William I., surnamed THE LION, king of Scotland: b. 1143; d. Stirling 1214. He was a grandson of David I., and brother of Malcolm IV., whom he succeeded in 1165. The source of his designation is one of the mysteries of history. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of the north of England, but under Malcolm these claims were virtually abandoned and the king of Scots received, as an equivalent for them, the earldom of Huntingdon and other valuable estates. William still coveted the Northumbrian region, and while attending Henry II. of England in his wars upon the Continent, is supposed to

WILLIAM OF MALMSBURY — WILLIAM AND MARY COLLEGE

have asked for a portion of the disputed territory. On being refused he invaded the district after the example of his ancestors, but on 13 July 1174 fell into the hands of the English. For security he was conveyed to Normandy, and there consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long vainly required from the government of Scotland. The treaty of Falaise, as the arrangement was termed, from the place of its adjustment, was revoked in 1189 by Richard I. of England in consideration of a payment of 10,000 marks, needed for his expedition to Palestine. William had several disputes with the Church, but was one of the early benefactors of the regular ecclesiastics, and founded in 1178 the great abbey of Arbroath, which he dedicated to Saint Thomas a Becket.

William of Malmesbury, māmz'bēr'i, English historian: b. probably in Somersetshire, about 1090; d. Malmesbury, Wiltshire, about 1143. He was educated at the Benedictine Abbey of Malmesbury of which he subsequently became librarian and precentor, and from which his name is derived. His works are in Latin and are of great historical value. They include: 'De Gestis Regum Anglorum,' a general history of the kings of England from 449 to 1128; 'Historia Novella,' containing the narration to 1142; 'De Gestis Pontificum Anglorum,' an ecclesiastical history of England down to 1123; 'Vita S. Dunstani'; 'Vita S. Wulfstani'; etc. The best edition of his English and Church histories is that of Stubbs in the *Rolls Series* (1887-8). Consult Birch, 'Life and Writings of William of Malmesbury' (1874); Stubbs' Prefaces in the *Rolls Series*; Norgate, 'England Under the Angevin Kings,' Vol. I. (1887).

William of Newburgh, English chronicler: b. Bridlington, Yorkshire, about 1156; d. Newburgh, near Coxwold, Yorkshire, about 1198. He was educated, lived all his life, and died in the Augustinian Abbey of Newburgh. He is one of the chief authorities for the reign of Henry II. His 'Historia Rerum Anglicarum' covers the period from 1066-98, is written in five books, and is highly valuable as a broadminded, just, and clear presentation of the happenings of the times, though his statements are not always accurate. His other works consist of three sermons. Consult Howlett in the *Rolls Series*, 'Chronicles of Stecher, Henry II., and Richard I.' (1884).

William of Tyre, Syrian historian and archbishop: b. probably in Syria, about 1137; d. about 1184. He was educated at Antioch and Jerusalem, and in 1175 was made archbishop of Tyre. He was one of the six bishops who represented the Latin Church of the East at the Lateran Council in 1179. His 'Historia Rerum in Partibus Transmarinis Gestarum' is one of the best histories of mediæval times, and is the principal authority for the history of the Latin kingdom in the East from 1127-84. He also wrote 'Historia de Orientalibus Principibus.'

William of Wykeham, wīk'am, English prelate, architect, and statesman: b. Wykeham, Hampshire, 1324; d. South Waltham, Hampshire, 24 Sept. 1404. He received a liberal education from the lord of the manor of Wykeham, and was afterward recommended by him to the

notice of Edward III., who made him chief keeper and surveyor of the several of the royal castles. He built Windsor Castle, and afterward, taking orders, held various ecclesiastical posts, becoming bishop of Winchester in 1367. He was lord chancellor of England 1367-71, founded in 1373 a grammar school at Winchester, which still exists as Winchester College, and New College, Oxford, which he completed in 1386. He was lord chancellor for the second time 1389-91 and rebuilt the nave of Winchester Cathedral in the Third Pointed manner 1395-1405. He is buried in a magnificent chantry chapel in the south arcade of the nave at Winchester. Consult 'Three Chancellors' (1860); and 'Lives,' by Lowth (1758); Moberly (1887).

William and Mary College, located at Williamsburg, Va. It was chartered in 1693, thus being the second oldest college in the United States; but an attempt was made to found a college in Virginia as early as 1619 when a grant of land for a 'seminary of learning' was made by the Virginia Company; a collegiate school was established at Charles City in 1621, but closed on account of Indian troubles in the next year. In 1635 Benjamin Symes established a free school in Elizabeth City County, the first in the thirteen colonies. In 1660 the Virginia assembly voted a grant of land for a college, but the disturbed condition of England at that time, and the disorders within the colony, prevented any further progress toward establishing an institution of higher learning until in 1691, when Rev. James Blair was sent to England to obtain a charter from the crown. In this he was successful, the charter being signed 8 Feb. 1693. Certain lands, a duty on the exports of tobacco, and other funds were appropriated to the use of the college. During the Revolutionary War the college lost the larger part of its endowment, the buildings were occupied by the British and the American and French troops, and the college was closed for a short time in 1781. After the Revolution, the college was reorganized and received a grant of land from the Virginia legislature; George Washington served as chancellor from 1788-99. During the Civil War the college was closed after 1861; about 90 per cent of its students enlisted in the Confederate service. It was occupied by the Federal troops and most of its buildings and property destroyed. In 1869 the main building was restored, and the college again opened, but under serious embarrassment; so serious did the financial difficulties become that its sessions were suspended in 1882, until 1888, when the State legislature appropriated \$10,000 a year, later increased to \$15,000. In 1893 the college received \$64,000 from Congress as indemnity for loss suffered during the Civil War.

The college has always given history and political science a recognized place in its curriculum, and was the first American college to establish chairs of law and history. Partially perhaps for this reason, its influence has always been felt in State and national history; it numbers among its graduates some of the leading men of the nation, including four presidents of the United States, Jefferson, Monroe, Harrison, and Tyler, also Chief Justice Marshall, Edmund Randolph, and General Scott. The first chapter of Phi Beta Kappa was established at William and Mary in 1776. The college was also the

first to introduce the elective system which was done in part in 1779 under Jefferson's guidance. In 1819 Jefferson declared in a letter to Francis Eppes that at William and Mary the student could pursue the course of his choice. At this time there appear to have been two classes of students—"regulars and irregulars." The first class took a prescribed course for A.B., the latter followed their own inclinations, and attended the schools of their own selection. The college was also the first to try the honor system, and a remarkable degree of freedom was permitted the students in the lecture room, and on examination. They were neither watched nor spied upon, and their word was taken as conclusive on any subject. There are now two courses offered, the Collegiate and the Normal. The Collegiate course is entirely elective in accordance with the group system; three degrees are conferred, A.M. (for graduate work), A.B. and B.L., according to the subjects elected. The Normal course is two years in length, to which is added one year's practice work in the Matthew Whaley Model and Practice School. The campus consists of 42 acres upon which there are eight buildings. In the centre is the main college structure. Though it has passed through three fires, the walls are the same as were originally put up in 1693. They are, therefore, the oldest college walls in the United States. The lawn in front of the college is covered with beautiful trees, and the buildings are furnished with electric lights, artesian well water, and new equipment. The college receives annually from the legislature \$25,000. The students in 1910 numbered 241, and the faculty 20.

LYON G. TYLER, LL.D.,
President of William and Mary College.

William Henry, Fort, in the town of Caldwell, N. Y., at the head of Lake George (q.v.). In August 1757, it was taken from the English by a force of French and Indians under Montcalm.

William Jewell College, located in Liberty, a suburb of Kansas City, Mo. It was founded in 1849 by the Baptists of Missouri; Dr William Jewell of Columbia, Mo., was one of the leaders in the movement for the establishment of the college, and contributed \$10,000 in lands toward the endowment, hence the college was named for him. It was opened to students in 1850, and on account of financial difficulties was closed in 1855-7; just as the college was becoming prosperous, the Civil War again forced the work to suspend from 1861 to 1868; for a part of that time the building was occupied by the Federal troops. Since 1877 the endowment has been raised to over \$200,000. The college offers four courses or groups, leading to the degree of A.B. Some studies are required in all groups, and some are free electives. The curriculum includes several theological courses, completion of which by arrangement with the Southern Baptist Theological Seminary at Louisville, Ky., entitles the student to credit at that seminary. The degree of A.M. is conferred for graduate work. There are also courses in elocution and oratory and music, and an Academic Department. A college band and a college orchestra are maintained. There are 44 scholarships. The student organizations include four literary societies, Philharmonic (a musical society), a Young Men's Christian Association, and mis-

sionary societies. The buildings include Jewell Hall (the original building), Vardeman Hall, Brown Hall, Wornall Hall, Ely Hall, The Cottages, and the gymnasium. The library in 1910 contained 20,000 volumes; the students numbered 549, and the faculty 45.

William Penn Charter School, a secondary day school for boys, located at Philadelphia. In 1683 the governor and council of the province engaged a schoolmaster (Enoch Flower) for "the instruction of the youth" of Philadelphia; from this grew the Charter School, founded in 1689 and incorporated in 1698 by the council and lieutenant-governor as "the public school founded in Philadelphia at the request, costs, and charges of the people of God called Quakers." Although supported by the Quakers, it was open to all, and for more than 60 years continued to be the only public place for instruction in the province. In 1701 Penn was asked to confirm the lieutenant-governor's charter by one under his own hand and seal. This he did on the same day that he chartered the city itself. The school therefore enjoys, in this regard, a unique distinction. The two subsequent charters issued by Penn, one in 1708 and the other in 1711 (the last the legal one under which the board now works) rendered broader and more far-reaching the measures for the school's future development. The school was entirely emancipated from denominational control, and the title of the corporation changed by omitting the words: "at the request, costs and charges of the people of God called Quakers," the title in the final charter standing: "The Overseers of the Public School founded by Charter in the Town and County of Philadelphia in Pennsylvania" (the word "public" being used in the English sense, open to all willing to pay the fees). The school premises are now located in the heart of the city, and taken with the beautiful playing fields in the suburbs of the city, presented to the school in 1903, are valued at \$250,000; and the scholarship funds amount to about \$50,000. It is purely a day college preparatory school for boys, and has for years been famed for both its high standard of scholarship and the intelligent care devoted to physical training. The students have long numbered over 500, it being the largest boys' day school of its class in the United States. Its attendance is by no means confined to residents of Philadelphia, boys being admitted from other places.

William Tell (Wilhelm Tell), the last completed drama of Schiller, was written in 1804, one year before his death. It is considered one of his finest works, being the most mature expression of that idea of freedom with which he had opened his poetic career in 'The Robbers' 20 years before. But whereas Karl Moor was warring against the existing order of things, the Swiss were fighting for the preservation of their ancient rights. Although the play is named after Tell, he is merely the nominal hero. The real protagonists are the whole people. A drama by James Sheridan Knowles, entitled 'William Tell,' was produced by Macready in 1825, and the same theme forms the libretto of Rossini's 'Guillaume Tell' (1829).

Williams, will'yamz, Alpheus Starkey, American soldier: b. Saybrook, Conn., 20 Sept. 1810, d. Washington, D. C., 21 Dec. 1878. Graduated from Yale in 1831, he studied in the

WILLIAMS

law school there in 1834-5, and in 1836 began legal practice in Detroit, Mich. There he held local offices, and in 1840-4 was probate judge of Wayne County. He became proprietor of the *Daily Advertiser* of Detroit in 1843, and remained its editor until 1848. During the Mexican War he was lieutenant-colonel of the 1st Michigan volunteers. In May 1861 he received the commission of brigadier-general of volunteers. Later he was a division commander in the Shenandoah, and in 1862 became temporary commander of the 12th corps, which he directed until April 1863, leading it at South Mountain and Antietam. He was also in command of a corps at Gettysburg and, after his transfer to Tennessee, at Lookout Mountain. After commanding a division of the 20th corps in Sherman's Atlanta campaign, he was appointed in November to command that corps, and he led it in the 'March to the Sea,' and the campaign in the Carolinas. Upon the capture of Savannah he was brevetted brigadier-general of volunteers. Mustered out in January 1866, he was minister to San Salvador in 1866-9, and member of Congress in 1875-8. In 1870 he was Democratic candidate for the governorship of Michigan.

Williams, Annie Bowles 'Jak', American writer of juvenile tales: b. Connecticut 1840. She published 'Birchwood' (1885); 'The Fitch Club'; 'Professor Johnny' (1887); 'Rolf and His Friends'; 'Who Saved the Ship?'; 'The Giant Dwarf'; 'The Riverside Museum.'

Williams, Arthur Llewellyn, American Protestant Episcopal bishop: b. Owen Sound, Ont., 30 Jan. 1856. He received an academic education and engaged in the railroad business in Colorado for several years. He then studied theology and was graduated at the Western Theological Seminary, Chicago, in 1888. Admitted to the diaconate in 1888, and to the priesthood in 1889, he served as missionary in White River Valley, Colo., 1888-9, was rector of St. Paul's Church, Denver, 1891-2, and of Christ Church, Chicago, 1892-9. In October 1899 he was consecrated bishop-coadjutor of Nebraska.

Williams, Channing Moore, American Protestant Episcopal bishop: b. Richmond, Va., 18 July 1829. He was graduated from William and Mary College in 1853 and from the Theological Seminary at Alexandria, Va., in 1855. He took deacon's orders in 1853 and was ordained to the priesthood in 1857. He served as a missionary in China in 1857-66 and in the last mentioned year was consecrated bishop of Yeddo, Japan, resigning his bishopric in 1889, when he retired from episcopal duties, but continuing his missionary labors. Died 2 Dec. 1910.

Williams, Edward (bardic name, *Iolo Morganwg*), Welsh poet and Celtic scholar: b. Llanecvan, Glamorganshire, 1745; b. Flemingstone, Glamorganshire, 17 Dec. 1820. With Owen Jones and Pughe, he edited the 'Myvyrian Archæology' (1801-7), and himself published 'The Fair Pilgrim, a Poem Translated from the Welsh' (1792); 'Poems Lyric and Pastoral' (1794); 'Psalms of the Church in the Desert' (1812) in Welsh. To the 'Fair Pilgrim' he appended specimens of Druidical 'Triads,' which, after a long protracted controversy and on the non-production of their manuscripts, are commonly looked on as a literary forgery. Williams was a friend of Southey and

ranked foremost among Welsh poets of his time. His posthumous Welsh work, 'Secrets of the Bards of the Isle of Britain' (1829) was edited by his son, Taliessin Williams. Consult Waring, 'Recollections and Anecdotes of Edward Williams' (1850).

Williams, Eleazer, American missionary to the Indians: b. about 1788; d. Hogsburg, Franklin County, N. Y., 28 Aug. 1858. After obtaining a secondary education in Massachusetts, upon the outbreak of the War of 1812 he became a United States government agent among the northern Indians, and later fought in several actions and was severely wounded at Plattsburg (14 Sept. 1814). After the war he became a clergyman of the Protestant Episcopal Church, and for many years labored as a missionary among the Indians of the northern Wisconsin region. By many he was identified with Louis XVII. of France (q.v.), and on this subject much has been written from J. H. Hanson's article in 'Putnam's' for February 1853 to M. H. Catherwood's 'Lazarre' (1901). Among his writings were 'Caution against Our Common Enemy' (1815), and a translation into Mohawk of the 'Book of Common Prayer' (1833).

Williams, Ephraim, American soldier: b. Newton, Mass., 24 Feb. 1715; killed near Lake George, N. Y., 8 Sept. 1755. In early life he was a sailor, but in the war with France, 1740-8, served as captain of a New England company in Canada. He received from Massachusetts in return for his services a grant of 200 acres of land in the present townships of Adams and Williamstown and was made commander of all the frontier posts west of the Connecticut River. When hostilities broke out afresh he was put in command of a regiment and ordered to join the New York forces under Sir William Johnson, who were marching northward to attack the French. He was proceeding with a large body of soldiers to attack Dieskau's advance force, when the whole party was entrapped in an ambush of French and Indians, and at the first fire Col. Williams fell mortally wounded. While in camp at Albany he had made his will, bequeathing his property for the establishment of a free school in Massachusetts, which later became Williams College. In 1834 the alumni of Williams College erected a monument to his memory on the spot where he fell. See WILLIAMS COLLEGE.

Williams, Francis Churchill, American author, son of Francis Howard Williams (q.v.): b. Philadelphia, Pa., 23 April 1869. He was graduated from the University of Pennsylvania in 1891 and until 1900 was engaged in journalism. His publications include: 'J. Devlin, Boss' (1901); 'Stories of the College,' joint author (1902); 'The Captain' (1903); etc.

Williams, Francis Howard, American dramatic writer. b. Philadelphia, Pa., 1844. Among his plays are: 'The Princess Elizabeth: A Lyric Drama' (1880); 'The Higher Education' (1881); 'A Reformer in Ruffles' (1881); 'Master and Man' (1884). He has also written 'Atman: A Story' (1894); 'The Flute Player, and Other Poems' (1894); 'Pennsylvania Poets of the Provincial Period' (1893).

Williams, Sir George, English founder of the Young Men's Christian Association. b. Dulverton, Somerset, 11 Oct. 1821; d. London

WILLIAMS

6 Nov. 1905. He became converted in 1837 and was active in attempts to promote the religious welfare of his associates. In 1841 he went to London, gathered together the young men employed in the same establishment as himself, and on 12 June 1844, organized, with others, a society called the "Young Men's Christian Association," which was designed to be "a society for improving the spiritual condition of young men engaged in the drapery and other trades." He was treasurer of the Young Men's Christian Association, 1863-85, and succeeded Lord Shaftesbury as its president in the last named year. He was knighted in 1894. (See *YOUNG MEN'S CHRISTIAN ASSOCIATION*.) Consult Stevenson, 'Historical Records of the Young Men's Christian Association from 1844 to 1884' (1884).

Williams, George Frederick, American politician b. Dedham, Mass., 10 July 1852. He was graduated from Dartmouth in 1872, studied later at Heidelberg and Berlin, was admitted to the bar and has since practised his profession in Boston. He edited Williams' 'Citations of Massachusetts Cases,' and the 'Annual Digest of the United States,' Vols. X. to XVII. He was a member of the State legislature in 1889, sat in Congress 1891-3, and was an unsuccessful Democratic candidate for governor of Massachusetts in 1895, 1896, and 1897.

Williams, George Washington, American author: b. Bedford Springs, Pa., 16 Oct. 1849; d. 1891. He was of African descent, served in the Civil War, subsequently attended school, and was for a time engaged as a preacher and then as a journalist. In 1877 he was graduated from the Cincinnati Law School and in 1879-81 served in the Ohio legislature. He was United States minister to Haiti in 1885-6, and in 1888 was a delegate to the World's Conference of Foreign Missions at London. He was editor of the Cincinnati 'Southwestern Review' and of the Washington 'Commoner,' and published: 'History of the Negro Race in America from 1619 till 1880' (1883); 'History of Negro Troops in the War of the Rebellion' (1887); 'History of the Reconstruction of the Insurgent States' (2 vols., 1889); etc.

Williams, Gershom Mott, American Protestant Episcopal bishop: b. Fort Hamilton, N. Y., 11 Feb. 1857. He studied at Cornell 1875-7, was in mercantile business for several years, and after studying law was admitted to the Michigan bar in 1879. The next year he was ordained to the Episcopal ministry and held rectorships at Detroit, Buffalo, Milwaukee, and Marquette (1880-96). In 1896 he was consecrated bishop of Marquette.

Williams, Helen Maria, English author: b. London 1762; d. Paris 15 Dec. 1827. She was introduced to public notice by Dr. Andrew Kippis, who recommended very highly her first work, a legendary tale in verse, entitled 'Edwin and Elfrida,' which was published in 1782. Between this period and 1788 she published an 'Ode on Peace' (1783); 'Peru, a Poem' (1784); and a collection of miscellaneous poems (1786). In 1790 she settled in Paris, in the same year published a series of 'Letters Written in France,' and in 1792-6 a second series, 'Letters from France,' and in 1795 a third, 'Letters Containing a Sketch of the Politics of France.'

These 'Letters' advocated the doctrines of the Girondists, on whose downfall she was in great danger, and for some time imprisoned. They are one-sided and replete with inaccuracies and misrepresentations. Among her remaining works are: 'A Tour in Switzerland' (1798); 'Narrative of Events in France' (1815); 'Correspondence of Louis XVI.' (1803); 'Letters on the Events Which Have Passed in France since the Restoration in 1815' (1819); an English translation of Humboldt's 'Personal Narrative' (1814); 'Julia,' a novel (1790); and the story, 'Perouren, the Bellows-mender' (1801), on which was based Lord Lytton's 'The Lady of Lyons.' Mention may be made of several well known hymns by her, such as 'My God, all Nature owns Thy Sway,' and 'While Thee I Seek, Protecting Power.'

Williams, Henry Shaler, American geologist and paleontologist: b. Ithaca, N. Y., 6 March 1847. He was graduated from Yale in 1868, occupied the chair of geology at Cornell in 1879-92, resigning in the last mentioned year to accept a similar chair at Yale, which he still occupies. He was secretary of the International Congress of Geologists at Washington in 1891 and was chairman of the section of geology and geography of the American Association of Advanced Sciences in 1892. He has made extensive studies of the Devonian and Carboniferous systems and has published: 'The Classification of the Upper Devonian' (1885); 'Fossil Faunas of the Upper Devonian' (1884-7); 'The Cubiodont Zone and Its Fauna' (1890); 'Correlation Papers, Devonian and Carboniferous' (1891); 'Shifting of Faunas as a Problem of Stratigraphic Geology' (1903); etc.

Williams, Isaac, English theologian and author: b. near Aberporth, Cardiganshire, 12 Dec. 1802; d. Stinchcombe, Gloucestershire, 1 May 1865. He studied at Trinity College, Oxford, in 1831 became fellow there and took priest's orders, and was known as one of the leading Tractarians (q.v.). He was Newman's curate at St. Mary's and was later in charge of the church at Littlemore. With Newman, Froude, and Keble, he contributed to the 'British Magazine' the verse later collected as 'Lyra Apostolica' (1836); and in the 'Tracts for the Times' he wrote Tract 80, 'Reserve in Communicating Religious Knowledge,' the subject of much discussion. In 1842 he was an unsuccessful candidate for the Oxford chair of poetry, the defeat being regarded as also the first for the Tractarians as a party. From 1842 to 1848 he was curate at Dartington, and afterward resided at Stinchcombe, where he assisted somewhat in the clerical duties of the parish. Among his further publications are several books of poetry, such as 'The Cathedral' (1838; 8th ed. 1859; reprinted 1889 ed. Benham); 'Thoughts in Past Years' (1838; 6th ed. 1852), and 'The Baptistery, or the Ways of Eternal Life' (1842-4; 6th ed. 1863); and some volumes of prose, chiefly sermons. 'Selections' from his writings appeared in 1890; his 'Autobiography' in 1892.

Williams, James Douglas, American politician: b. Pickaway County, Ohio, 16 Jan. 1808; d. Indianapolis, Ind., 20 Nov. 1880. After a common-school education, he became a farmer in Knox County, Ind., first held office in 1838 as justice of the peace for Harrison township in

that county, and in 1843 was elected as a Democrat to the House of Representatives in the General Assembly. He sat in the House during seven sessions, and in the Senate for 12. In 1874 he was chosen to Congress, where he served until 1876, resigning upon his nomination as governor of Indiana. He was elected to the office in October, after a vigorous contest, his Republican opponent being Gen. Benjamin Harrison. His administration was one of economy and stability. His chief interest was in connection with the development of the agriculture of Indiana, and he was an incorporator and president of the State Board of Agriculture. He was widely known by his sobriquet of "Blue Jeans."

Williams, Jesse Lynch, American author: b. Sterling, Ill., 17 Aug. 1871. He was graduated from Princeton in 1892 and has since published 'History of Princeton University' with J. De Witt (1898); 'The Stolen Story and Other Newspaper Sketches' (1899); 'The Adventures of a Freshman' (1899); 'New York Sketches' (1902).

Williams, John, English prelate, archbishop of Canterbury: b. Aberconway, Carmarvonshire, Wales, 25 March 1582; d. Glodded 25 March 1650. He was educated at Cambridge, took orders in the English Church in 1600, succeeded Bacon as keeper of the great seal in 1621, an office which he held till 1626, and was consecrated bishop of Lincoln in November 1621. Though a favorite with James I. he incurred the dislike of Charles I., and having supported the Petition of Right in 1628, was prosecuted by Laud before the Star Chamber, charged with betraying the king's secrets. After eight years' legal proceedings he was suspended from his see, fined successively £10,000 and £8,000 and imprisoned in the Tower 1636-40. Released by the Long Parliament and restored to his see, he was made archbishop of Canterbury in 1641, but was again sent to the Tower with 11 other bishops on account of their protest against the validity of acts passed during their enforced absence from the House of Lords. He was released in 1643 and during the Civil War supported the royal cause and fortified and held Conway Castle. Consult: 'Scrinia Reserata,' a Latin life of the prelate, by Hacket and Phillips (1700).

Williams, John, American clergyman, known as "the redeemed captive": born Roxbury, Mass., 10 Dec. 1664; d. Deerfield, Mass., 12 June 1729. He was graduated from Harvard in 1683, was settled in Deerfield in 1686, and ordained in 1688. On 29 Feb. 1704, a party of 200 French and 142 Indians surprised the town, and some of them, breaking open Williams' house, killed two of his children and his negro servant, and forced him with his wife and six of his surviving children (his son Eleazer was absent) to set out with other prisoners for Canada. On the second day's march Mrs. Williams fell from exhaustion, and was despatched with a tomahawk. About 20 other prisoners were murdered under similar circumstances. On his arrival in Canada, after a journey attended by almost unexampled hardships, Williams was treated by the French with great humanity and even courtesy, and at length was redeemed, and arrived in Boston, 21 Nov. 1706,

with 57 other captives, among whom were two of his children. His daughter Eunice, 10 years of age, was left behind, and married an Indian. Williams, soon after his return, resumed his pastoral charge at Deerfield, and published a narrative of his captivity, entitled 'The Redeemed Captive Returning to Zion' (1707), a narrative of his adventures which furnishes a good picture of the frontier dangers of the time.

Williams, John ("Anthony Pasquin"), English author: b. London 28 April 1761; d. Brooklyn, N. Y., 12 Oct. 1818. He was educated at the Merchant Taylors' School, London, went to Ireland about 1781, edited various periodical publications, and in 1784 was obliged to flee the country to escape prosecution for an attack upon the government. In 1787 he went to France and on his return established the Brighton 'Guide.' He was afterward engaged as a dramatic critic and by his ruthless sarcasm made himself the terror of the theatrical world. In 1797 he sued Robert Faulder, a bookseller, for libel, the latter having denounced him as "lost to every sense of decency," but was nonsuited in his case because of proof that he himself had grossly libeled every respectable character in the kingdom, not sparing even the sovereign. Shortly afterward he came to the United States, where he edited in New York a Democratic newspaper. He died in poverty. His publications include: 'Poems' (1789); 'Legislative Biography' (1795); 'Life of Alexander Hamilton' (1804); 'The Dramatic Censor' (1811); etc.

Williams, John, English missionary: b. Tottenham, Middlesex, 29 June 1796; d. Erromango, New Hebrides, 20 Nov. 1839. At 14 he was apprenticed to an ironmonger, but having offered himself to the London Missionary Society, was sent in 1816 to Eimeo, one of the Society Islands. Later he settled in Raiatea, the largest of the group, and labored here with marvelous success, his powers of organization being as conspicuous as his zeal. In 1823 he went to Raratonga, the chief of the Hervey Islands, where he met with continued success. He next built a boat with his own hands in which during the next four years he visited many of the South Sea Islands, extending his missionary labors to the Samoa Islands. In 1834 he returned to England, there superintending the printing by the Bible Society of his Raratongan New Testament, and raising \$20,000 to equip a missionary ship for Polynesia. In 1838 he went out again, visited many of the stations he had already established, and sailed as far west as the New Hebrides, where he hoped to plant a mission, but was killed and eaten by the savage nations of Erromango. He published 'Narrative of Missionary Enterprises' (1837). Consult the biographies by Campbell (1842) and Prout (1843).

Williams, John, American Protestant Episcopal bishop: b. Deerfield, Mass., 30 Aug. 1817; d. Middletown, Conn., 7 Feb. 1879. He was graduated from Harvard in 1835, studied theology and was ordained deacon in 1838 and priest in 1841. From 1837 to 1840 he was tutor in Washington (now Trinity) College, then was for a time assistant minister of Christ Church, Middletown, Conn., and rector of St. George's, Schenectady, N. Y., 1842-8. In 1848

he was elected president of Trinity College and professor of history and literature. He was consecrated assistant bishop of Connecticut in 1851, but retained the presidency of Trinity for two years longer, and then became vice-chancellor. Several students for holy orders having placed themselves under his direction, an informal theological department grew up, which was afterward incorporated as the Berkeley Divinity School at Middletown, Bishop Williams remaining the principal instructor. On the death of Bishop Brownell in 1865, he assumed sole charge of the diocese, whose administration had for a long time been practically in his hands, and at the same time became chancellor of Trinity College. In the General Conventions of 1883 and 1886, he was chosen chairman of the House of Bishops, and in 1887 succeeded Bishop Lee as presiding bishop of the Episcopal Church. His published works include, 'Thoughts on the Gospel Miracles' (1848) and 'Studies in the Book of Acts' (1888).

Williams, John Joseph, American Roman Catholic prelate: b. Boston, Mass., 22 April 1822; d. there 30 Aug. 1907. His elementary education was obtained at the Cathedral parochial school; in the Sulpician College, Montreal, Canada, he studied philosophy, and later theology with the Sulpicians in France. In 1845 he was ordained priest by Archbishop Affre and upon returning to Boston, Mass., was appointed assistant at the Cathedral, in 1855 becoming its rector. Two years later he was made vicar-general of the diocese and rector of Saint James' Church, both of which positions he held for 9 years, being then chosen coadjutor to Bishop Fitzpatrick, whose death, however, occurred before the arrival of the papal bulls for Father Williams' consecration. Therefore, on 11 March 1866, Father Williams was consecrated Bishop of Boston. A vast territory was then under his jurisdiction, as his diocese included the entire State of Massachusetts, but when, in 1870, Bishop Williams went to Rome to attend the Vatican Council, he applied for the division of his diocese, the result being that Springfield, Mass., was erected into an episcopal see. In 1875 Pope Pius elevated Boston to a metropolitan see, Bishop Williams becoming its first archbishop, the pallium being conferred upon him 2 May 1875. Foremost among the monuments to his zeal and energy are the new Holy Cross Cathedral of Boston and Saint John's Theological Seminary. At present (1905), the archdiocese of Boston, one of the largest in the United States, includes a Catholic population of about 700,000; 543 priests; 221 churches; 76 parochial schools; 6 orphanages; 5 hospitals and other benevolent and educational institutions.

Williams, Jonathan, American soldier: b. Boston, Mass., 20 May 1750; d. Philadelphia, Pa., 16 May 1815. He was secretary to his grandfather, Benjamin Franklin, while the latter was ambassador to France, and while abroad read widely concerning fortification and made an especial study of military science. He returned with Franklin in 1785 and was for some years a judge of common pleas at Philadelphia. In 1801 he entered the army, soon becoming inspector of fortifications and taking command of West Point in 1803. He re-

signed in the year last named, but returned to the army in 1805 as chief engineer and superintendent at West Point. While in charge of the fortifications of New York he built Fort Columbus and Castle William on Governor's Island, Castle Clinton (Castle Garden), and Fort Gansevoort. On the breaking out of the War of 1812, as senior officer at Castle William, he claimed command of that fort, and on this being assigned elsewhere, he resigned. He was elected to Congress in 1814, but did not take his seat. As the first person in the United States to apply the principles of scientific engineering he has often been called "the father of the corps of engineers." He published 'The Use of the Thermometer in Navigation' (1799) and translated 'Elements of Fortification' (1801), and 'Kosciusko's Manœuvres for Horse Artillery' (1808).

Williams, Martha McCulloch, American author: b. Montgomery County, Tenn. She was married to T. M. Williams and began writing on removing to New York in 1887. She has published 'Field Farings' (1892); 'Two of a Trade' (1894); 'Next to the Ground' (1901); etc.

Williams, Sir Monier Monier. See **MONIER-WILLIAMS, SIR MONIER**.

Williams, Roger, the pioneer of religious liberty and founder of Rhode Island: b. Wales 1607; d. Providence, R. I., March 1684. There is considerable doubt as to the year of Williams' birth; authorities differ. Some of them claim he was born in 1601, others in 1603. The writer after a careful examination of all the records, places the date at 1607. Consult Straus' 'Roger Williams, the Pioneer of Religious Liberty,' pp 5-11.

The most recent investigations have shown that he was the son of James Williams, a merchant tailor of London, and of his wife, Alice Williams. While yet a mere boy, he attracted the attention of Sir Edward Coke, while taking shorthand notes of sermons and speeches in the Star Chamber, and Coke placed him (1621) in the Charter House School. From there (1623) he went to Pembroke College, Cambridge University, from which he took his degree in 1626. Williams soon developed into a decided opponent of the liturgy and ceremonies of the church, thereby placing himself on the side of the most radical Puritans. On 1 Dec. 1630 he embarked from Bristol with his young wife in the ship *Lyon*, and arrived at Nantasket 5 Feb. 1631. No sooner had he set foot upon the shores of New England than he came in conflict with the ecclesiastical and civil authorities of the colony, whom he found arrayed against him, for asserting and maintaining with unwavering fidelity those principles which have immortalized his name as the champion of religious liberty.

The arrival of Williams in America was noted by Winthrop as that of a "Godly minister." He was already known and esteemed by the leading men in the colony, and he was immediately invited to officiate in the place of John Wilson as teacher of the church at Boston, which, however, Williams declined on the ground that they of Boston were an unseparated people. It is well to note here a distinction between the Pilgrims and the Puritans.

The former were Separatists, and were associated as a distinct church before they left Holland. A principle of their church was, that the State had no right to punish for spiritual sins. The Puritans, on the other hand, though Non-conformists, were not separated from the established church. Their scruples were against conforming to many of the ceremonies of that church. He was invited by the Pilgrim Church at Salem to become an assistant or teacher in place of Higginson, who died a few months before. This call Williams accepted, but the civil authorities, the General Court of Boston, interfered and remonstrated with the Salem church for choosing him. He remained at Salem only a short while, and in August removed to Plymouth, where he was received with much respect. Here he remained for two years, supporting himself by manual labor and officiating as "teacher" in the church among the Pilgrim fathers. During his residence here he became intimately acquainted with various Indian chieftains in the neighborhood, which intimacy had an important bearing in his subsequent life in the founding of Rhode Island.

In August 1633 he returned to Salem and resumed his ministerial labors there, but at every turn he found himself in conflict with the clergy and the court of Massachusetts. He was frequently cited to appear before the court. In October 1635 he was tried before the General Court, consisting of the governor, the deputy governor, 8 assistants, and some 25 deputies. The formal charges against him were four in number, but the basis of them may be summed up by the statement that he maintained that the civil power has no jurisdiction over the conscience, or, in other words, he maintained the absolute liberty of conscience. The court convicted him and sentenced him to banishment. In January 1636 he left Salem to escape arrest, and to seek a refuge from the tyranny of the church brethren. He went first to Seekonk, and afterward with four companions who joined him, embarked in a canoe to seek a spot beyond the jurisdiction of the Massachusetts and Plymouth colonies. The site selected by him was Providence, so named by him in gratitude for "God's merciful providence to him in his distress."

In March 1683 a large section of land was conveyed to him by deed from the Indians, which land he divided equally among his followers. Mrs. Williams and her two infant children joined him, and friends from Massachusetts and England soon joined the Rhode Island Colony.

William Coddington, who had been a merchant in Boston, was elected as magistrate with the title of judge, and three elders were elected to assist him. This form of government continued until 1640. Meanwhile the antagonism of the Boston Colony to Williams continued, and a law was passed which practically excluded the inhabitants of Providence from entering Massachusetts. In March 1641 the government of Rhode Island was regularly organized.

The formation of the New England Confederacy, in 1643, which included the four colonies, Massachusetts, Connecticut, Plymouth and New Haven, was a matter of anxious concern to the Rhode Island and Providence settlements. The open hostility of the Confederacy, together with

the claim made by Massachusetts that the Rhode Island and Providence colonies had no authority to set up civil government, induced these latter colonies to seek a charter from England. At an assembly held in Newport 19 Sept. 1642, a committee was appointed to procure a charter, and in July 1643 Williams set sail from New York for England. Here on 17 March 1644 he obtained a charter which gave to the towns of Providence, Portsmouth and Newport, full power to rule themselves under the name "The Providence Plantations of Narragansett Bay." This charter granted in the most friendly spirit everything that Williams prayed for.

Williams returned to America in 1644, landing in Boston 17 September. He ventured to tread on this forbidden ground by exhibiting a letter from 12 leading members of the Parliamentary party in England, addressed to the government of Massachusetts. He therefore proceeded without hindrance to Providence. In May 1647 a form of government was agreed upon, after many delays, the office of president of the colony, which so naturally belonged to Williams, was bestowed upon John Coggeshall of Newport. Dissensions arose within and without the new colony; Williams was called upon to pacify the Indians and to settle numerous disputes ecclesiastical and civil. In October 1652 Williams was again in England making efforts to secure a renewal of the colony's charter; this he secured and returned to America, landing in Boston in 1654. In this same year the reorganization of the Rhode Island government took place, and on 12 September Williams was elected president of the colony. He was again elected 20 May 1656. In this year the persecution of the Quakers in Boston soon made Rhode Island a Quaker refuge, and they were made welcome largely through the influence of Roger Williams. For many years, until 1677, Williams continued to hold various offices and to guide the affairs of the colony. In the Indian wars of 1675-6 (see KING PHILIP'S WAR), when Providence was attacked, Williams was captain of militia and drilled companies in Providence. See RHODE ISLAND.

The life of Roger Williams was now rapidly nearing its end. His Providence friends did not fully appreciate the life-work of this sturdy champion of soul liberty, which was destined to bring happiness to a continent. At his death the brief record was conveyed to the outer world in a letter dated 10 May 1684, stating, "The Lord hath arrested by death our ancient and approved friend, Mr. Roger Williams, with divers others here." He was buried in a spot which he himself had selected on his own land, near where, 47 years before, he had first landed within the colony he founded.

The principles of religious liberty had been proclaimed in all ages, and under many climes, with more or less plenitude, but Roger Williams was the first to organize and build up a political community with absolute religious liberty as its chief cornerstone. To him the successful pioneer of these principles is due to a larger extent than to any man, the American system of a "free church in a free State."

No portrait of him in bronze or in marble, or of any kind, has come down to us, and when in 1872 the State of Rhode Island presented a statue of her founder to the nation, which now

WILLIAMS.—WILLIAMS COLLEGE

stands in the rotunda of the Capitol at Washington, the artist had to make the memorial from an ideal conception.

Among the great men of his times with whom Williams stood in close personal relations, besides his early patron, Sir Edward Coke, were Cromwell, John Milton, Sir Henry Vane, the younger, Major-General Harrison of the Parliamentary army; Lawrence Lord, president of the Council of State, and others of distinction in England and America. See UNITED STATES—CIVIL AND RELIGIOUS LIBERTY.

OSCAR S. STRAUS,

Author of 'Roger Williams, the Pioneer of Religious Liberty.'

Williams, Rowland, Anglican clergyman and educator: b. Halkyn, Wales, 16 Aug. 1817; d. Broad Chalk, near Salisbury, Wiltshire, 18 Jan. 1870. He was graduated from King's College, Cambridge, in 1841 and was fellow and tutor there in 1839-50. He accepted the chair of Hebrew at the theological college of Saint David's in 1850, acting also as vice-president of that institution. In 1854 he became select preacher at Cambridge and became vicar of Broad Chalk in 1858, while still retaining his offices at the college. His views on inspiration brought him into disfavor with the Welsh clergy and in 1862 he was prosecuted and condemned for heresy in the Court of Arches. He resigned his professorship and retired to his vicarage at Broad Chalk, where he henceforth lived, though in 1864 he secured from the Privy Council a reversal of the judgment against him. His publications include: 'Rational Godliness' (1855); 'The Hebrew Prophets' (1868-71); 'Psalms and Litanies' (1872); etc. Consult *Ellen Williams' 'Life and Letters of Rowland Williams' (1872).*

Williams, Samuel Wells, American missionary and philologist: b. Utica, N. Y., 22 Sept. 1812; d. New Haven, Conn., 17 Feb. 1884. He was graduated from the Rensselaer Institute, Troy, N. Y., in 1832, and in 1833 went to Canton, China, as printer to the American Mission. He was compelled to remove to Macao in 1835, and in 1845-8 was in the United States, after which he resumed his work in Canton. He acted as interpreter to Commodore Perry on his Japanese mission in 1853-4, and in 1857 resigned his position in the mission and became secretary and interpreter to the United States legation. He assisted in the negotiation and ratification of the treaty of Tientsin in 1858-9. Upon the establishment of the United States legation at Peking under Burlingame in 1862 he became its secretary, occupying the post until 1876, when he returned to the United States and accepted the chair of Chinese at Yale, where he remained until his death. He was editor and contributor to the 'Chinese Repository' during the time of its publication (1832-51), and was a leading authority on the Chinese and Japanese languages. He superintended the press work of Medhurst's 'Dictionary of the Hokkien Dialect' (1837) and with Bridgman issued 'Chinese Christomathy' (1841). His other works include: 'Easy Lessons in Chinese' (1842); 'The Topography of China' (1844); 'The Middle Kingdom' (1848); 'A Syllabic Dictionary of the Chinese Language' (1874); etc. The two last mentioned are the greatest of his works and are still among the

highest authorities in their field. Consult F. W. Williams, 'Life and Letters of Samuel Wells Williams' (1888).

Williams, William, American patriot and signer of the Declaration of Independence: b. Lebanon, Windham County, Conn., 8 April 1731; d. there 2 Aug. 1811. He was graduated at Harvard College in 1751, in 1755 served on the staff of Col. Ephraim Williams in the Lake George expedition, and after the revolutionary troubles began was an active member of the council of safety, and in October 1775 was chosen a representative in the Continental Congress. His property was nearly all expended in the war, and he was tireless in obtaining private donations to supply the army, going from house to house to collect articles that could relieve the destitution of the soldiery. He held nearly every office in the gift of his constituents, served nearly 50 years in the State legislature, and was a member of the convention of his State which adopted the Federal constitution.

Williams, Sir William Fenwick, British soldier: b. Annapolis Royal, Nova Scotia, 4 Dec. 1800; d. London 26 July 1883. He was graduated at Woolwich in 1821, entered the Royal Artillery in 1825, and after serving in the East Indies several years was appointed British commissioner to the conference in Erzerum, to settle the boundary dispute between Persia and Turkey in Asia. During the Crimean war he was sent as commissioner to the relief of Kars, and there promptly reorganized the troops. After defending Kars for four months against the Russians he met their commander, Gen. Muravieff, on the heights above the city and defeated him with great slaughter. Assisted by the Hungarian Gen. Kmetz, he did all in his power for the defense of Kars, but on 14 Nov. 1855 was forced by famine to capitulate. On his return to England he was created baronet, received the rank of pasha of the highest order and the decoration of the Medjidieh from the sultan; and was made a grand officer of the Legion of Honor of France. He sat in Parliament for Calne 1856-9 and then assumed the command of the forces of British North America. He was administrator of Canada in 1860-1; became full general in 1868; was governor-general of Gibraltar 1870-3; and retired from the army in 1877.

Williams College, located at Williamstown, Mass. It owes its origin to the bequest of Col. Ephraim Williams, for establishing a 'Free School' in Williamstown. The bequest was made in 1755; the property was sold, and the funds were allowed to accumulate till 1783, when a free school was incorporated by the legislature, and a lottery granted for raising funds to erect a building; in 1790 the building (now the West College) was completed, and the school was opened 20 Oct. 1791. In 1793 the institution was incorporated as a college under its present name, the property vested in the free school was transferred to the college, and a grant of \$4,000 was made by the State to purchase a library and apparatus. The college subsequently received other appropriations from the State; in 1796 the legislature granted two townships of land; in 1809 an additional township; and in 1814 appropriated the taxes from the Massachusetts Bank for 10 years to Harvard, Williams, and Bowdoin. Williams'

WILLIAMSBURG

share in which amounted to \$30,000; in 1899 the legislature appropriated \$25,000, and in 1868, \$75,000. In 1866 the first foreign missionary society in the United States was formed at Williams. In 1836-72 Mark Hopkins (q.v.) was president of the college, and during his administration it attained a high degree of prosperity.

The college course is arranged on the group system, there being three groups of studies, language, philosophy (including history and political economy), and sciences. The work of the freshman year is largely required; after the first year all work is elective, but students must elect a major course (15 semester hours), and a certain amount of work in each group. The degree of A.B. is conferred, and A.M. for graduate work and thesis. There are 76 general scholarships, and one special prize scholarship. The principal college buildings are West College, the oldest, erected 1790; East College, erected in 1798, burned in 1841, and rebuilt; South College; Griffin Hall; Hopkins Observatory, built in 1837, under the direction of Prof. Albert Hopkins, the first college observatory in the United States; Lawrence Hall Library; Jackson Hall; Alumni Hall Chapel; College Hall; Clark Hall; Field Memorial Observatory, erected 1882, containing a fine meridian circle by A. Repsold and Sons, Hamburg; Morgan Hall, Lasell Gymnasium; Hopkins Memorial Hall; Thompson Chemical Laboratory; Thompson Biological Laboratory; Thompson Physical Laboratory; College Infirmary, and Jesup Hall. The library in 1910 contained 68,000 volumes; in addition the two literary societies have libraries containing 9,000 volumes. The productive fund in 1910 amounted to \$1,387,000; the students numbered 560 and the faculty 58; the total number of graduates was 4,669.

Williamsburg, wll'yamz-bërg, Ky., town, county-seat of Whitley County; on the Cumberland River, and on the Louisville & Nashville Railroad; about 95 miles south by east of Lexington. It is in an agricultural and coal-mining region. It has flour and lumber mills and large coal yards. It has one bank which has a capital of \$60,000. Pop. (1890) 1,376; (1900) 1,495; (1910) 1,710.

Williamsburg, Va., city, county-seat of James City County; on the Chesapeake & Ohio Railroad; about 48 miles southeast of Richmond. It is the oldest incorporated town in the State. It was established in 1632, and prior to the Revolution it was the capital of the province. It was also the State capital until 1779. It has many historic associations connected with the pre-Revolutionary days and the Civil War. It is the seat of William and Mary College (q.v.), and it has the Eastern Lunatic Asylum, opened in 1773, the oldest institution of its kind in the United States. On 3 May 1862 it was occupied by the Confederate forces, who had withdrawn from Yorktown, and three days later an attack was made by the Union forces. The battle lasted all day. (See WILLIAMSBURG, BATTLE OF.) Pop. (1910) 2,714.

Williamsburg (Va.), Battle of. Gen. J. E. Johnston abandoned Yorktown (q.v.) on the night of 3 May 1862, and at noon next day had assembled his army at Williamsburg, whence his head of column (Magruder's division) was

ordered to continue the march toward Richmond. Longstreet's and McLaws' divisions remained until the trains could be got on the road, and to cover the retreat. McClellan was surprised to find Yorktown evacuated, had made no provision for such a contingency, and it was noon of the 4th before the pursuit began, when Gen. Stoneman's cavalry and four batteries of horse artillery, followed by Hooker's division of infantry on the direct road from Yorktown to Williamsburg, and Smith's division from Lee's Mills, were on the roads to harass the Confederate rear and cut off those who had marched from Lee's Mills and by that road. Stoneman overtook Stuart's Confederate cavalry about midway between Yorktown and Williamsburg, driving it steadily back to the works in front of Williamsburg, where he was checked by Stuart and by McLaws with two brigades of infantry, and began to withdraw when McLaws attacked him with two regiments and he was obliged to abandon one of his guns stuck in the mud. Gen. Emory, who had been sent to the left with a regiment of cavalry and a battery, to intercept such of the Confederates as were retreating on that road, encountered Stuart himself, with a regiment and a battery, Stuart falling back, skirmishing, until dark. Hooker, who was expected to support Stoneman, found himself cut off by Smith's division, which, moving from Lee's Mills, had been ordered by Sumner to cross over from its proper road and take the one on which Hooker had been ordered by McClellan. Smith reaching it at the Half-Way House before Hooker came up, the latter was obliged to wait several hours until Smith could pass. Smith overtook Stoneman about 5.30 p.m., relieved him, and forming line prepared for a charge through a body of woods and beyond to the Confederate works, but it was approaching night when the formation was completed and the movement began; the woods were found to be dense, with tangled undergrowth; and the movement was abandoned as impracticable, and the troops went into bivouac. Hooker crossed over to the road Smith was to have taken, marched until midnight, and lay down in rain and mud, some distance on Smith's left, but the same distance from the Confederate works. The divisions of Kearny, Couch, and Casey were ordered to follow Hooker and Smith; McClellan remained at Yorktown to supervise the embarkation of Franklin's division, which was to go up York River; and Sumner, at noon of the 4th, was directed to take command of the troops ordered in pursuit. Hooker, acting on the strength of the orders he had received personally from McClellan before marching from Yorktown, opened the battle very early in the morning by advancing on Fort Magruder, which was in his immediate front, and flanked right and left nearly across the peninsula by 12 smaller redoubts, all having cleared ground in front dotted with rifle-pits. The roads were muddy, axle-deep; Grover's brigade began the attack at 7 a.m. by driving in the Confederate skirmishers; and two batteries were pushed to within 700 yards of Fort Magruder, and with the aid of Grover's skirmishers silenced its fire by 9 o'clock. But the contest had not fairly begun. McLaws, who held the Confederate position on the evening of the 4th, had followed the train during the night, and Longstreet was left in command, who placed the

WILLIAMSBURG BRIDGE

brigades of R. H. Anderson and Pryor with some field guns in the works that had been held by McLaws. Anderson on the right and Pryor on the left were thrown against Hooker, followed in quick succession by Wilcox, who reinforced Anderson, and by A. P. Hall, and about 10 A.M. Pickett's brigade was brought up. These five brigades attacked Hooker's three brigades with great impetuosity, making a desperate effort to turn the left, held by Patterson's New Jersey brigade. Grover moved a part of his brigade to Patterson's support, and Taylor's brigade was sent in; but the odds were too great, and by 11 o'clock Hooker's line was pushed back, uncovering the two batteries, both of which were abandoned, one being retaken. Hooker called for reinforcements, but it was not until 3 P.M. that Kearny's division came to his relief. Kearny made a vigorous attack, and by nightfall had regained a part of the field from which Hooker had been driven. Hooker's loss was about 1,600. Hooker says in his report: "History will not be believed when it is told that the noble officers and men of my division were permitted to carry on this unequal struggle from morning until night unaided in the presence of more than 30,000 of their comrades with arms in their hands; nevertheless it is true." Gen. Webb, the historian of the Peninsula campaign, says: "From 7 A.M. till noon Hooker, alone on the left, had been doing all the fighting. No troops fell into line of battle on his right. No other line was engaged anywhere during the forenoon." Sumner, on Hooker's right, had been employed in reconnoitering, with the intention to turn the Confederate left, and near noon Gen. Hancock, with five regiments and a battery, was sent to seize a redoubt, apparently unoccupied, on the Confederate left, one of four redoubts northward of Fort Magruder. By midday he had seized it and, pushing forward, occupied a second empty redoubt and sent back for reinforcements, as he was now confronted by the enemy, who held the two redoubts between him and Fort Magruder. Twice Sumner ordered two brigades to reinforce, and twice he countermanded the order, finally sending him orders to return, but he had sent him some artillery. Meanwhile D. H. Hill's division had been recalled from its march in retreat and ordered to the left of the Confederate line, and Gen. Early, first to arrive with his brigade, obtained permission of Gen. Johnston, who also had returned to the field, to attack one of the batteries, which was annoying the Confederate troops near Fort Magruder. It was after 5 P.M. when D. H. Hill and Early, with two regiments each, pushed forward through dense undergrowth to an open field, early in advance, and when they came within easy range Hancock, who was falling back, following his artillery, turned upon Early, poured in two effective volleys, and charged, driving Early back upon Hill, and both from the field, inflicting a loss of nearly 400 men, among them Gen. Early, who was severely wounded. Hancock's loss was 31. Late in the afternoon McClellan came up and ordered troops to Hancock's assistance, but Hancock had repulsed Early before they reached him. McClellan made dispositions to renew the battle in the morning, but during the night Johnston evacuated Williamsburg, leaving D. H. Hill to bring up the rear. The Union troops engaged numbered about 20,000 men; the Con-

federates, about 15,000. The Union loss, mostly in Hooker's division, was 456 killed, 1,410 wounded, and 373 missing or captured. Incomplete Confederate returns show a loss of 103 killed, 1,458 wounded, and 133 captured or missing. Consult: 'Official Records,' Vol. XI.; Webb, 'The Peninsula'; 'McClellan's Own Story'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.; Johnston, 'Narrative of Military Operations.'

E. A. CARMAN.

Williamsburg Bridge, an immense structure in New York which is the largest span suspension bridge of its kind in the world. Work on the structure was begun in October 1896. The bridge spans the East River from Delancey Street, Manhattan, to South Fifth and South Sixth streets, Brooklyn. Its total length from the street grade in Manhattan to the street grade in Brooklyn is 7,200 feet. The width of the bridge is 118 feet. In carrying capacity it exceeds any other bridge in the world. It provides for two 18-foot roadways, two footpaths, four street railway tracks, two elevated railway tracks, and two bicycle paths. The length of the main span is 1,600 feet, or exactly five feet six inches more than that of the Brooklyn Bridge (q.v.). The bridge is 7,264 feet long, or about 1,275 feet more than the Brooklyn Bridge. The foundations of the new structure consist of timber caissons filled with concrete. The anchorages are massive structures. The one on the Manhattan side rests on 3,500 piles, while the one on the Brooklyn side is built on natural sand. The weight of the steel in each of the towers is 3,048 tons. The steel in the Brooklyn approach weighs 6,085 tons, while that in the Manhattan approach weighs 10,550 tons. The main span weighs 7,773 tons, while the cables and fittings weigh 5,000 tons. The diameter of the suspension cables, outside of the wires, is 18¾ inches. There are 7,696 wires in each cable. Each wire is about 3-16 of an inch in diameter. The timber used in the construction of the bridge amounted to 6,500,000 feet. The excavating equaled 125,000 cubic yards. Of concrete masonry there are 60,000 cubic yards, and of stone masonry 130,000 cubic yards. The steel used amounted to 40,000 tons. The foundations for the towers of the bridge rest on the solid rock. The north pier on the Manhattan side is 56 feet deep at high water, while the south pier is 10 feet deeper. On the Brooklyn side the north pier is 110 feet below high water, while the south pier is only 90 feet deep. The first wire for the construction of the temporary footbridge was strung on 11 April 1901, and the first wire for the permanent cable crossed on Friday, 29 Nov. 1901. The bridge was opened to the public 19 Dec. 1903. Following are figures comparing the Williamsburg Bridge with the Brooklyn Bridge as regards their cost, length, capacity, and details of construction:

BROOKLYN BRIDGE.

Total cost	\$24,750,000
Total length	5,989 feet
Length of span over river	1,595 feet
Height from high water to top of towers	278 feet
Height of centre of bridge structure from East River	135 feet
Weight of suspended structure between towers	6,400 tons
Daily passenger capacity, each way	700,000

WILLIAMSON — WILLIAMSTOWN

Extreme width	85 feet
One deck, net width	71 feet
Number of wires in each cable	5,296
Total miles of wire in four cables	14,361
Diameter of cables	15½ inches
Ultimate strength of each cable, in tons	12,200
One promenade, two trolley tracks.	
Two roadways, two railway tracks.	

WILLIAMSBURG BRIDGE.

Total cost	\$20,000,000
Total length	7,364 feet 4 inches
Length of span over river	1,600 feet
Height from high water to top of towers	333 feet
Height of centre of bridge structure from East River	193 feet
Weight of suspended structure between towers	7,771 tons
Daily passenger capacity, each way	2,000,000
Extreme width	118 feet
Two decks, net width (both)	137 feet
Number of wires in each cable	7,700
Total miles of wire in four cables	17,433
Diameter of cables	18½ inches
Ultimate strength of each cable, in tons	26,500
Two promenades, four trolley tracks, two bicycle paths.	
Two roadways, two railway tracks.	

Williamson, wil'yam-sôn, Alexander Wil-
Ham, English chemist and educator: b. Wandsworth, Surrey, 1 May 1824. He was educated at Paris, Heidelberg, and Giessen, in 1849 was appointed professor of practical chemistry at University College, London, and in 1875 he accepted the chair of chemistry also, occupying both chairs until 1887 when he resigned and was appointed professor emeritus. He has made important researches on etherification, gas analysis, the atomic theory, etc., and has written several important papers concerning his investigations, including 'Etherification and the Constitution of Salts,' which attracted widespread notice. He also published 'Chemistry for Students.' He is a member of different English and foreign scientific societies, and has been president of the Chemical Society and of the British Association.

Williamson, Francis John, English sculptor: b. Hampstead, England, 17 July 1833. He was a pupil of J. H. Foley and later became his assistant, afterward settling at Esher, Surrey, where he has since lived. He has executed many ideal and private commissions, including portraits of the royal family at the order of Queen Victoria. Among his works are statues of Queen Victoria in Australia, India, Ireland, London, etc.; Dean Milman in Saint Paul's Cathedral; and numerous public statues in different parts of the British Isles.

Williamsport, wil'yamz-pôrt, Ind., city, county-seat of Warren County; on the Wabash River and the Wabash Railroad; 71 miles northwest of Indianapolis. It was founded in 1827. It is the trade centre of an agricultural region, and is also situated within three miles of large coal mines; it has a building-stone quarry, grist-mills and warehouses; and two state banks with a combined capital of \$100,000. There is a high school founded in 1884. Pop. (1910) 1,243.

Williamsport, Md., town in Washington County; on the Potomac River, the Chesapeake & Ohio Canal, and the Cumberland Valley and West Maryland R.R.'s; 65 miles northwest of Washington. It was founded in 1787; in 1863 Lee's army crossed the Potomac at this point on the march to Gettysburg. It is situated in an agricultural and timber region, and carries on a considerable trade. It has flour and lum-

ber mills and sash and door factories; and a national bank with a capital of \$100,000. There is a high school, and several elementary schools, including one for colored pupils. Pop. (1910) 1,571.

Williamsport, Pa., city, county-seat of Lycoming County; on the West Branch of the Susquehanna River, and on the Pennsylvania, the Northern Central, and the Philadelphia & R. R.R.'s; about 95 miles north of Harrisburg. It is on the Alleghany plateau, in an agricultural and mining region. The chief manufacturing establishments are steel works, lumber mills, furniture and rubber goods factories, wood-working machinery works, wire rope, nail, and engine factories, boot and shoe factories, silk mills, sewing-machine factory, and fire escape works. In 1900 (government census) Williamsport had 396 manufacturing establishments, capitalized for \$2,863,811 and employing 5,595 persons, to whom were paid annually \$2,065,930. The total cost of raw material each year was \$6,420,337, and the value of the finished product \$11,199,600. The lumber and timber products for 1900 were valued at \$1,429,028; the leather products, \$839,375; and the foundry and machine shop products, \$747,617. The city has an extensive trade in lumber products and coal.

The principal public buildings are the government building, city-hall, opera house, city hospital, Home for the Friendless, and Masonic Temple. The city has two parks, Brandon and Vallamont; and Sylvan Dell and Starr Island are near by. There are over 50 churches, with 14,000 communicants. The educational institutions are Dickinson Seminary (M. E.), a high school, opened in 1869, 14 public schools, two large Roman Catholic parish schools, and two commercial colleges. The seven banks have a combined capital of \$1,225,200. The government is vested in a mayor, who holds office three years, and a council of 39 members. The board of education is chosen by popular vote.

Williamsport was settled in 1779, and set off as a town in 1795. In 1806 it was incorporated as a borough, and in 1866 was chartered as a city. The city grew slowly until 1850, when the lumber industry began. Since then the growth has been rapid and the manufacturing and commercial industries have kept pace with the population. Pop. (1850) 1,615; (1880) 18,034; (1890) 27,132; (1900) 28,757; (1910) 31,860.

JOHN R. BIXLER,

Managing Editor, 'The Williamsport Sun.'

Williamstown, Australia, a seaport in Victoria, on the southwest shore of Hobson's Bay, immediately opposite Port Melbourne, and 9½ miles southwest of Melbourne. The business interests of the town largely centre in the shipping. The piers are commodious, and there are shipbuilding yards, patent slips, and a dry-dock called the Alfred Graving Dock, opened in 1874 and improved in 1897-8. The chief buildings are the churches, the mechanics' institute, the custom-house, the sailors' rest, banks and similar buildings, etc. Basalt and brown coal are worked near the town, and several manufactures are carried on. Pop. about 16,000.

Williamstown, Mass., town in Berkshire County; on the Hoosac and Green rivers, and on the Fitchburg (Boston & Maine) Railroad;

APPROACH TO THE WILLIAMSBURG BRIDGE

Total width, 118 feet, including four street railway tracks, two elevated railway tracks, two eighteen-foot roadways and two foot-passenger and bicycle paths.

WILLIMANTIC—WILLOUGHBY

about five miles west of North Adams and 40 miles east of Troy, N. Y. It was settled in 1753 and was named West Hoosic. In 1765 it was incorporated and the name was changed to Williamstown in honor of Ephraim Williams. In 1793 Williams College (q.v.) was opened, since when it has been a favorite residential town. There are five villages within the town limits. The chief industrial establishments are a cotton mill, a large bleachery, and large freight yards. Market gardening is carried on to quite an extent. There are two banks, one national and one state. Pop. (1890) 4,221; (1900) 5,013; (1910) 3,708.

Willimantic, wil-l-man'tik, Conn., city in Windham County; at the confluence of the Willimantic and Natchaug rivers, and on the Central Vermont and the New York, N. H. & H. R.R.'s; about 35 miles east by south of Hartford. It has the water power from the Willimantic River, which here has a fall of 91 feet within the city limits. The chief manufacturing establishments are cotton warp mills, print factories, thread and silk mills, foundry, machine shops, spool factory, and silk machinery works. The educational institutions are a State normal school, a high school, public graded schools, a large parish school, a public library containing about 6,000 volumes, and the Dunham Hall Library. There are two banks, the national bank has a capital of \$100,000 and the combined deposits (1903) amount to \$850,170. It was incorporated as a borough in 1833, and in 1893 was chartered as a city. Pop. (1910) 11,230.

Willis, wil'is, Nathaniel Parker, American author: b. Portland, Me., 20 Jan. 1806; d. Idlewild, N. Y., 20 Jan. 1867. He was graduated from Yale in 1827, and was employed by S. C. Goodrich ('Peter Parley') to edit two annuals, the 'Legendary' in 1828, and the 'Token' in 1829. In 1828 he established at Boston the 'American Monthly Magazine,' which, after he had conducted it for two and a half years, was merged in the New York 'Mirror.' He now set out on a tour of travel through Europe, visiting France, Italy, Greece, European Turkey, Asia Minor, and finally England, with the rank of an attaché to the American embassy at Paris, but chiefly as a correspondent of the 'Mirror,' for which he wrote his 'Pencilings by the Way,' later (1835) published in book-form. He returned in 1836, became in 1839 editor of the 'Corsair,' a New York periodical (1839-40), and in the same year again went to England. He returned to New York in 1846, and subsequently directed two short-lived papers, 'The New Mirror' (1843-4) and 'The Evening Mirror' (1844-5). Once more in Europe in 1845-6, he became in the last named year editor of 'The Home Journal,' the most successful of all his journalistic ventures, in the management of which he was associated with George P. Morris (q.v.). Willis was from the first a facile versifier, and a prose-writer of great reportorial cleverness. His scriptural poems were in their day very popular, and many are still readable; and his other verse, when nothing else, was metrically able. Sometimes it reached real poetic value, and effective specimens of it have been preserved by the anthologist. His fiction, except the 'Slingsby' papers, written for the English 'New Monthly,'

is generally without interest, save for its extravagance. 'Pencilings by the Way' (1835) abounds in talented sketches of contemporaries. Willis was the most successful American journalist of his time, and his vogue was great. Among his principal works are: 'Pencilings by the Way' (1835); 'Inklings of Adventure' (1836); two dramas entitled 'Two Ways of Dying for a Husband' (1839); 'Loiterings of Travel' (1840); 'Dashes at Life with a Free Pencil' (1845); 'People I Have Met, or Pictures of Society and People of Mark, Drawn Under a Thin Veil of Fiction' (1850); 'Hurry-graphs' (1851); a 'Health Trip to the Tropics' (1853); 'Outdoors at Idlewild' (1854); 'The Rag-bag,' a collection of ephemera (1855); 'The Convalescent, His Rambles and Adventures.' Consult the 'Life' by Beers ('American Men of Letters,' 1885). There is an estimate of Willis in Lowell's 'Fable for Critics.'

Willis's Rooms. See ALMACK'S.

Willmar, wil-mar, Minn., village, county-seat of Kandiyohi County, on Foot Lake and on two branches of the Great Northern Railroad; about 95 miles west by north of Minneapolis. The village was founded in 1868. It is in an agricultural and stock-raising region and has a large trade in grain, hay, dairy products, and live stock. It has nine churches, a high school and graded schools. The three banks, one national and two state, have a combined capital of \$40,000 and deposits (1903) amounting to \$873,070. Pop. (1890) 1,825; (1900) 3,409; (1910) 4,135.

Willpah, an Athapascan tribe of North American Indians who formerly occupied the territory drained by the upper waters of Chehalis River and its tributaries in southwestern Washington. They ceded their lands to the United States in 1864, when but few of them remained.

Willoughby, wil'o-bl, Sir Hugh, English Arctic explorer: b. probably Risby, Derbyshire, about 1500; d. about 1554. In 1553 he was appointed to command an expedition fitted out by London merchants 'for the discovery of regions, dominions, islands, and places unknown,' and on 10 May sailed from Deptford with three vessels, the Bona Esperanza, his own ship, with 35 persons; the Edward Bonaventure, carrying 50 men; and the Bona Confidentia, with 28 men. They sighted the coast of Norway about the middle of July and during a storm in the middle of September the Edward Bonaventure, at Senjen, parted company with the two other vessels, which reached Russian Lapland, where they found a good harbor at the mouth of the river Arzina. Here Willoughby and his 62 companions perished during the course of the winter. The following year Russian fishermen found the ships with the dead bodies of the crews, together with commander's journal, and a will witnessed by Willoughby, showing that some of the mariners were alive in January 1554. Chancellor, after being separated from his comrades, finally reached Archangel, near the mouth of the river Dwina, in the White Sea. News of his arrival was immediately despatched to the Czar Ivan Vasilievitch, who invited the mariners to the court of Moscow. A direct trade with Russia resulted from Chancellor's discovery.

Willoughby, Westel Woodbury, American publicist b. Alexandria, Va., 20 July 1867. He was graduated from Johns Hopkins University in 1888 and for several years practised law in the District of Columbia. He has published: 'The Supreme Court of the United States: its History and Administrative Importance' (1890); 'Government and Administration of the United States' (1891); 'The Nature of the State' (1896); 'Rights and Duties of American Citizenship' (1898); 'Social Justice' (1900).

Willoughby, William Franklin, American economist, twin brother of Westel Willoughby (q.v.) b. Alexandria, Va., 20 July 1867. He was graduated at Johns Hopkins University in 1888; was expert in the United States Department of Labor 1890-1900; and in 1900 was made special agent on education and social economy of the United States Commission to the Paris Exposition. He has several times represented the Department of Labor at international congresses for the investigation of labor conditions in Europe, is a member of the American Economic Society, a fellow of the Royal and American Statistical societies, and a lecturer on economics at Johns Hopkins. He published 'Workman's Insurance' (1898).

Willow, a genus of trees and shrubs (*Salix*) of the order *Salicales*. The species, of which more than 150 have been described, are natives mostly of the North Temperate zone, but a few are indigenous in the tropics and in the South Temperate zone, and some are found close to the limit of perpetual snow in the Arctic zone and upon lofty mountains, where they are reduced very greatly in stature, etc. One of these last, a European species (*S. herbacea*), rarely exceeds an inch in height. Willows are characterized by simple, usually lanceolate leaves, which in the bud are surrounded by a single bud-scale, flowers naked dioecious, in catkins, followed by dehiscent fruits containing little appendaged seeds which usually float readily with the breeze. In general, the species are best adapted to wet ground, along streams, etc., and on this account are frequently planted to dry out damp ground and for improving the sanitary conditions around cess-pools. Like the Australian gum-trees (*Eucalyptus*, q.v.), which are similarly used, they transpire immense quantities of water. Some of the species are of importance along streams and lakes where they prevent the washing of the soil either by current or wave. In pleasure grounds, summer resorts, etc., they are often planted because they will thrive almost anywhere and also because they quickly produce an effect. In such capacity, however, they should be used more as temporary than as permanent trees and should be replaced by better, sturdier trees, such as maples, elms, beeches, and others of slower growth. Some of the species or their varieties produce pleasing effects during winter because of their yellow or red branches; in spring by their yellow catkins, or their weeping habits. Willow wood is white, light, soft, porous, generally durable in water. It is used for turning, cabinet work, fuel, and for charcoal-making. The charcoal is highly valued for making crayons and gunpowder. The trees are widely planted in Europe for pollarding (q.v.), to supply fuel, poles, etc.

The most important industry connected with

willows is the growing of osiers (q.v.) for making baskets, wickerwork, etc. The species popularly used in Europe, where the industry is very important, are: the common osier (*S. viminalis*), which yields general purpose rods; fine basket osier (*S. purpurea*); green-leaved osier or ornard (*S. triandra*); golden, or white osier, or willow (*S. alba*); and varieties of these. In America the climate is considered unfavorable to some of the European species and so native species and varieties are more popular. Propagation for osier culture is always by means of cuttings, which are either pieces of branches or single-eye cuttings. The former are made about 15 inches long, planted 15 to 18 inches asunder in rows from 18 to 24 inches apart; the latter are planted very close together so as to produce attenuated shoots of small diameter. The cuttings are planted preferably upon alluvial soils since such produce the finest rods, and will continue profitable much longer than plantations on lighter soils. On light soils the useful age ranges from 15 to 20 years. Plantations are not made upon clay soils since such give unsatisfactory results.

Having been planted the only attention usually given is an occasional shallow cultivation to destroy weeds. After the leaves have fallen the harvest is made, the rods graded, those for brown baskets dried and piled under cover; those for white baskets tied in bundles, placed upright in shallow trenches containing about 3 inches of water until growth starts in the spring when they are peeled by means of a "break." In unfavorable seasons they may require a sort of fermentive process under litter to loosen the bark. The osier industry of Holland, Belgium, France, and England is very extensive. It is mainly confined to low grounds flooded by the tide. In the United States the leading regions of osier culture are western New York, and southeastern Michigan; lesser areas exist near Baltimore, Md., Milwaukee, Wis., and Cincinnati, Ohio. The annual production of baskets in the United States is estimated at approximately \$4,000,000.

The white or Huntingdon willow (*S. alba*) is one of the most widely used European species, but is little grown in America. It is a large tree, often 80 feet high, with usually a short thick trunk often exceeding 3 feet in diameter. It is specially noted for its exceedingly rapid growth and the large number of uses that are made of it, both ornamentally and economically. The brittle willow (*S. fragilis*), a native of Europe and northern Asia, becomes 30 or more feet in height and is well known in America, where it was introduced as a hedge tree about the middle of the 19th century. Stakes cut from the tree in early spring and driven in the ground will soon become trees. It is less useful than the preceding, but is popular for pollarding. Its twigs and smaller branches are very brittle at the point of union with the main stem. The weeping or Napoleon's willow (*S. babylonica*) is a native of the Caucasus, whence it has been taken to most civilized countries throughout the world, in many of which it has become a favorite tree in cemeteries. It has a large number of varieties. The Egyptian willow (*S. aegyptiaca*) is noted for the perfumed water distilled from its flowers in India.

Among the American species the yellow willow (*S. vitellina*), which is common in the

WILLOW HERB—WILLUGHBY

East, is probably the largest and best known. It approaches in size and habit the Huntingdon willow, with which it was formerly united by botanists. The black willow (*S. nigra*) is also indigenous in the East. It grows about 35 feet tall, and is noted for its rapid distribution along streams into which its brittle twigs fall as they are broken off by every strong wind, and carried far away by the current before they lodge and take root. Other species exhibit this trait more or less also. The pussy willow (*S. discolor*) is also an eastern species well known because of its silky downy catkins which appear in early spring before the leaves. It is usually a shrub, but sometimes becomes a short boled tree 15 or 20 feet high. Its twigs are often gathered in late winter, placed in water in a warm room or greenhouse, and the catkins thus forced into bloom. Treated in this way it is sometimes seen in florists' stores. Other well known American species are *S. lucida* which grows about 12 feet tall, and the heart-leaved willow (*S. cordata*) which grows about twice as large. Some species are popularly called "sallow" in Great Britain. Of these the best known are the long-leaved willow (*S. grandiflora*), gray willow (*S. cinerea*), round-eared willow (*S. aurita*), and round-leaved willow (*S. caprea*). Their chief uses are for hoops, stakes, tools, etc. They are used very little for baskets and wicker-work, since they are usually less pliable than oaks.

A very large number of insects feed upon the willow; 223 have been enumerated by Packard as found in America; in Europe 386 have been recorded. Among these are several species of plant-lice, gall-mites, and scale insects. The larvæ of two longicorn beetles bore in the trunk and branches, and a twig-boring larva, the willow-shoot horn-tail (*Phyllocolpa integer*) bores in the twigs in which the mother deposits her eggs, and in which the pupa state is passed during the winter. The larva of the American cimbex (*Cimbex americana*) which is the largest species of American saw-flies, lives upon the foliage as do also the larvæ of another saw-fly, the yellow spotted willow-slug (*Nematus ventralis*).

Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900-2); Packard, 'Insects Injurious to Forest Trees' (Washington 1890).

Willow Grouse, or Ptarmigan. See PTARMIGAN.

Willow Herb. See EPILOBIUM.

Willow Oak. See OAK.

Willow Pattern, a design used in the manufacture of stone and porcelain ware, generally executed in dark blue, in imitation of a Chinese design. The name is taken from a willow tree, which is a prominent object in the design.

Willow Wren, or Willow Warbler, a European warbler (*Phylloscopus trochilus*), dull olive-green on the upper part of the body, yellowish-white on the breast and below. The nest is placed on the ground, most commonly against a bank among long grass or weeds, but often at the foot of a bush, and, like that of the wood wren, is covered with a dome having a rather wide hole in the side, whence this species and its congeners are called "oven birds." The willow wren is a graceful, active bird, sitting rest-

lessly from twig to twig, and its song is loud and sweet.

Willows, Cal., town, county-seat of Glenn County; on the Southern Pacific Railroad; about 150 miles north by east of San Francisco. In the centre of the town is a grove of willows, the only one in that section, hence the name of the place. The county court-house is a fine building, erected in 1894 at a cost of \$150,000. The town ships large quantities of farm products and fruit. It has a state bank which has a capital of \$300,000. Pop. (1880) 750; (1890) 1,176; (1900) 893; (1910) 1,139.

Wills, William Gorman, Irish dramatist: b. Kilmurry, Ireland, 28 Jan. 1828; d. London 13 Dec. 1891. He was educated at Trinity College, Dublin, studied art in the Royal Hibernian Academy, and for a time engaged as a portrait painter. After 1862, however, he devoted himself extensively to literature, though in 1868 he resumed portrait painting. He was the author of 'Notice to Quit' (1861); 'The Life's Evidence' (1863); and the dramas 'Charles the First' (1872); 'Eugene Aram' (1873); 'Marie Stuart' (1874); 'Jane Shore' (1876); 'Olivia' (1878); 'Sedgemoor' (1881); 'Claudian' (1885); 'A Royal Divorce' (1891); etc., and in conjunction with Sidney Grundy, 'Madam Pompadour.' Consult Archer, 'English Dramatists of To-day' (1882); Cook, 'Nights at the Play' (1883); Freeman Wills, 'W. G. Wills, Dramatist and Painter' (1898).

Wills, William Henry, English writer: b. Plymouth, England, 13 Jan. 1810; d. Welwyn, Hertfordshire, 1 Sept. 1880. He was a member of the original staff of 'Punch,' acting as dramatic critic and also contributing both prose and verse. His contributions included: 'Natural History of Courtship'; 'Comic Mythology'; 'Information for the People'; etc. In 1846 he became associated with Dickens, with whom he formed a lifelong friendship, as sub-editor of the *Daily News*. In 1849 he became assistant editor of 'Household Words' and in 1859 of 'All the Year Round.' He published 'Old Leaves Gathered from Household Words' (1860).

Wills, William John, Australian explorer: b. Totnes, Devonshire, 5 Jan. 1834; d. Cooper's Creek, Australia, about 1 July 1861. He studied medicine in London, and in 1852 emigrated to Australia where he was joined in the following year by his father, and together they practised medicine at Ballarat. In 1855, however, he became a surveyor of crown lands and in 1858 was appointed to the staff of the magnetic and meteorological observatory at Melbourne. In 1860 he joined the expedition under Robert O'Hara Burke (q.v.) as third in command, later becoming second, and crossed the continent northward, reaching the Gulf of Carpentaria, but on the return journey both Burke and Wills died of starvation. Wills' journal was recovered and published: 'A Successful Exploration from Melbourne to the Gulf of Carpentaria, from the Letters and Journals of William John Wills' (1863). Consult Howitt, 'History of Discovery in Australia' (1865).

Willughby, wil'-bî, Francis, English ornithologist: b. Wollaton Hall, Nottinghamshire, 1635; d. 3 July 1672. He studied at Cambridge, where he became the pupil of the famous natur-

WILMERDINO—WILMINGTON

alist, John Ray (q.v.), and with him made a continental tour (1663-4), making studies and collecting zoological specimens. Ray edited and translated his Latin 'Ornithologia' (1676) and in 1678 published it in English as 'The Ornithology of Francis Willughby.' Ray also edited Willughby's 'History of Fishes' (1686). To the 'Ornithologia' Buffon and Linnaeus were much indebted, and it is claimed that Willughby originated the Linnæan system of zoological classification.

Wilmerding, Pa., borough in Allegheny County; on the Pennsylvania Railroad; eight miles southeast of Pittsburgh. It was founded in 1859. It was laid out by the Westinghouse Air-brake Company, who have here their large manufacturing works. The water supply comes from the Monongahela River; natural gas is used for fuel, and every street is sewered. Pop. (1910) 6,133.

Wilmington, Del., city, port of entry, county-seat of New Castle County; on the Delaware River at the junction of the Brandywine and Christina creeks, and on the Pennsylvania (Philadelphia, Baltimore & Washington), the Baltimore & O., and the Philadelphia & R.R.'s; about 27 miles southwest of Philadelphia and 70 miles northeast of Baltimore. There are several regular lines of steamers, for passengers and freight, which connect the city with Philadelphia and with the Delaware River and Bay and several Atlantic ports. It ranks as the first city in the State in population, commerce, and industries.

Industries.—The chief industrial establishments are car works (the Pullman Company and the Pennsylvania have shops in the city), steel works, machine shops, foundries, paper mills, cotton mills, malleable iron works, fibre goods factories, and furniture. Leather goods, especially morocco, are manufactured here. In 1900 (government census) the 19 manufacturing engaged in turning out leather, tanned, curried, and finished, were capitalized for \$5,167,304 and had 2,454 wage-earners to whom were paid annually \$1,044,303. The total cost of raw material used annually was \$7,009,165 and the value of the finished products was \$9,379,504. The four iron and steel manufacturing were capitalized for \$4,051,880 and the value of the annual output was \$2,934,993. The 21 foundries and machine shops produced each year goods valued at \$3,299,509; the products of the three railroad car-works were, annually, \$3,274,922, not including repair work, which amounted to over \$1,000,000.

Other industries of importance are ship and boat building, meat packing, pulp manufacturing, and large paper-making machinery manufacturing. The total number of manufacturing establishments, in 1900, was 759, which were capitalized for \$28,372,043, and in which were employed 16,055 wage-earners. The total cost of raw material used annually was \$19,451,815, and the value of the annual output, \$34,053,324. Over 53 per cent of the manufacturing establishments of the State were located in Wilmington. A few miles outside the city limits is a large powder-manufacturing establishment, founded in 1801 by Pierre Samuel du Pont and his sons.

Buildings and Municipal Improvements.—The city is on land elevated sufficient to mate-

rially increase its healthfulness. The city extends about four miles back from the Delaware. The houses are nearly all of brick and stone,—no wooden buildings are permitted to go up in the city proper, but the old wooden buildings are allowed to remain. There are five parks, having a total area of 260 acres, and a number of small squares. The streets are well paved and sewered. There is a good water-works system. The principal public buildings are the government building, county courthouse, and city-hall. A building of special interest is the old Swedes' Church (Holy Trinity), built of brick in 1668. It is said to be the oldest building in the United States which has been in continuous use as a church since its erection. The city owns and operates the water-works.

Churches and Charitable Institutions.—The principal religious societies in the city are represented as follows: Methodists (white), 15 churches, (colored), seven churches; Baptist, Roman Catholic, and Protestant Episcopal, 10 each; Presbyterian, nine; Lutheran and Friends, two each; Congregationalist, Adventist, Jewish, Unitarian, and Swedenborgian, one each. There are a large number of charitable institutions; chief among them are the Home for Friendless Children; Saint Peter's Orphanage (R. C.) for girls; Saint Joseph's Home (R. C.) for colored children; two homes for aged men and women; and two hospitals. At Farnhurst, two miles out, is the Delaware State Hospital for the Insane, and near it the county almshouse.

Educational Institutions.—The State Industrial Schools for Girls and the Ferris Reform School for Boys are located here. Other educational institutions established here are Hebbes School, Wilmington Friends' School, Wilmington Military Academy, Ursuline Academy, a public high school established in 1872, Goldey College, Wilmington Business School, public and parish elementary schools, a free public library, which in 1768 was incorporated as the Wilmington Institute, and which now contains about 41,000 volumes; the Historical Society library, containing nearly 4,000; and the library of the Law Library Association of the county, which has about 16,000 volumes.

Banks and Finances.—There are seven national banks and one state bank with a combined capital of \$1,723,185; three trust companies with a combined capital of \$1,600,000; and a number of loan associations. The annual amount of business is about \$60,000,000. The foreign trade transacted through the port of Wilmington amounts annually to about \$5,000,000, nearly all of which is in exports. The annual cost for city maintenance and operation is about \$725,000. The principal items of expenditure are \$200,000 for schools; \$84,000 for police; \$41,000 for fire department; \$55,000 for water-works; and \$80,000 for interest on debt.

Government.—The government is vested in a mayor, who holds office two years, and in a council composed of 13 members, who are elected by wards, except the president, who is elected at large. The mayor appoints the board of water commissioners and the board of directors of the street and sewer departments. The council elects the city auditor, city clerk, and inspectors of meat, milk, oil, and markets. The judge of the supreme court appoints the police commissioners. The board of education, two

WILMINGTON

members from each ward, the city attorney, and city treasurer are chosen by popular vote.

History.—The first settlement was made in 1638 by a colony from Sweden, under Peter Minuit. They found here an Indian village called Minquas. The Swedes erected a fort to which they gave the name of Fort Christiana, in honor of the young daughter of Gustavus Adolphus, the king of Sweden. The village was called Christianaham. In 1655, the Dutch from New Netherlands bought the land on which Wilmington now stands, and other lands adjoining, from the Indians, and took forcible possession of the fort. The name was changed to Fort Altena. The Dutch retained possession for nine years, when they were supplanted by the English. It came under control of William Penn, after which the colony gave more attention to civic pursuits instead of wars and conquests. In 1731 the village was named Willingtontown, in honor of Thomas Willing, who had laid out the town. Later the name was changed to Wilmington. It was incorporated as a borough in 1739 and the first borough election was held 8 Sept. 1740. In 1832 it was chartered as a city.

Population.—(1880) 42,478; (1890) 61,431; (1900) 76,556; (1910) 87,411.

Consult: Powell, 'Historic Towns of the Middle States'; Ferris, 'History of the Original Settlements on the Delaware.'

Wilmington, N. C., city, port of entry, county-seat of New Hanover County; on the Cape Fear River, and on the Atlantic Coast Line and the Seaboard Air Line R.R.'s. It was first settled in 1730 and was first called New Liverpool and then Newton; in 1739 it was incorporated as a town and named Wilmington, and in 1744 was made the capital of the province. In 1765 the town took a decided stand against British authority, and refused to permit a British man-of-war to land a quantity of stamps, this being the first open armed resistance to the Stamp Act. On 18 July 1775, Fort Johnson, at the mouth of the river, was captured by the militia under Colonel John Ashe; and the royal governor was forced to leave the place. In 1781-2 Wilmington was occupied by the British, Cornwallis having his headquarters here. During the Civil War Wilmington was the most important port of the Southern States, the "gateway" between the South and foreign nations; and was consequently the chief resort of the blockade runners. The harbor and its approaches were strongly fortified by the Confederates; in January 1865, Fort Fisher (q.v.) was taken by the Federals, and this resulted in the evacuation of the other forts and the surrender of Wilmington. Wilmington was chartered as a city in 1866.

It is an important commercial city. Improvements in the harbor and river channel have been made by the Federal government at considerable cost, and the port accommodates vessels of the largest size. There are weekly steamboat lines to New York and points on the Cape Fear and Black rivers, and a large import and export trade, both foreign and domestic. In the fiscal year ending 30 June 1904 the exports amounted to \$21,000,000; the chief shipments are cotton, rice, turpentine, vegetables, lumber, and naval stores. Wilmington ranks fifth in receipts of cotton and fourth in ex-

ports. In manufacturing industries Wilmington ranks fourth in the State. In 1904, capital to the amount of \$5,600,000 was invested in manufacturing establishments, and \$1,380,000 was annually paid in wages; the value of the annual products was \$4,100,000. Eight lumber and timber establishments had an annual output valued at \$1,000,000, other manufactures were turpentine, resin, confectionery, foundry and machine-shop products, ice, chemicals, meal, cotton products, men's clothing, wagons, and carriages. Annual business of the city for 1903 was \$40,000,000 and the annual pay-roll was \$3,250,000. There are five banks with a combined capital of \$520,000 and deposits amounting to \$4,500,000. The principal public buildings are the government building, the county court-house, city-hall, Masonic Temple, the county hospital, the United States Marine Hospital, and the James Walker Memorial Hospital and W. H. Sprunt Annex. Other institutions are a county house of correction, county home, and the Catherine Kennedy Home for Aged Women. Various organizations assist the charitable institutions; such are the Bureau of Associated Charities, Ladies' Benevolent Society, a United Charities, and a Seaman's Friend's Society. There are 33 churches, 14 of which are for colored. There are public schools for white and for colored students, Roman Catholic parish schools, and a public library; and the city also contains Cape Fear Academy, Alderman's School, Academy of the Incarnation, and the Gregory Normal School (for the colored race). The government is administered under the charter of 1866, which provides for a mayor, who holds office two years, and a city council. The governor of the State appoints a board of audit and finance, who determine the salaries and control the municipal finances. The council elect many of the city officials. Pop. (1890) 20,056; (1900) 20,976, (1910) 25,748, an increase of nearly 23 per cent. Wilmington ranks as the first city of the State in population.

Revised by

WILMINGTON CHAMBER OF COMMERCE

Wilmington, Ohio, city, county-seat of Clinton County; on the Cincinnati & Muskingum Valley and the Baltimore & O. R.R.'s; about 53 miles northeast of Cincinnati and 60 miles southwest of Columbus. It is in an agricultural region. The chief manufacturing establishments are bent-wood and bridge-work factories, furnaces, machine shops, auger bit factory, creameries, and flour and lumber mills. The Wilmington College (Orthodox Friends) was established here in 1870. The two banks have a combined capital of \$200,000. Pop. (1910) 4,491.

Wilmington, Capture of. After Gen. Terry's capture of Fort Fisher (q.v.) 15 Jan. 1865, Terry posted his troops on an intrenched line across the peninsula, about two miles above the fort. An advance on Wilmington was not considered prudent until he could be reinforced, as Gen. Hoke, the Confederate commander, was holding Fort Anderson, on the west bank of Cape Fear River, about midway between Fort Fisher and Wilmington, and on the opposite bank had thrown up a line of intrenchments across the peninsula in Terry's front, behind which he had about 4,500 men. Fort Anderson was an extensive earthwork, mounting 10 heavy

WILMINGTON COLLEGE—WILMOT

guns, commanding the approaches by land and water and held by Gen. Hagood's brigade of 2,000 men. Gen. Grant ordered Gen. Schofield, with the Twenty-third corps, from Tennessee to the coast of North Carolina to co-operate with Gen. Sherman. Schofield's troops arrived at Alexandria and Washington late in January, where they were detained some days by the ice in the Potomac. Gen. Cox's division of 4,400 men went by steamers from Alexandria and landed on the peninsula, in rear of Terry, 9 February, raising Terry's command to 8,000 men. Schofield now took command; the fleet under Admiral Porter occupied positions in Cape Fear River and off the coast, covering both flanks of Terry's line, and, 11 February, Terry was pushed forward, supported by Cox, drove in Hoke's pickets and intrenched within 300 yards of his main line. An attempt on the 12th to turn Hoke's left by a co-operation of the army and navy was foiled by high winds and a violent storm. On the night of the 14th an attempt was made to move the pontoons upon their wagons along the beach with the troops; the wagons sank deeply in the sand, progress was very slow and it having become evident that the pontoons could not be got up to the point of crossing of Masonborough Sound before daylight, when the enemy would discover the movement, the attempt was abandoned and attention turned to Hoke's right, where it would not be required to contend with the difficulties of both land and sea. On the 16th Cox's and Ames' divisions were crossed by steamboats to Smithville, on the right bank of the river, where they were joined by Col. O. H. Moore's brigade, of Couch's division, and a battery, and, on the 17th Cox with four brigades and the battery advanced along the main Wilmington road, driving in the Confederate pickets and bivouacking near Fort Anderson, with his right resting on the river. Next morning the advance was resumed and the enemy driven within the works. Moore's and Henderson's brigades were intrenched on the south side of the fort, while Cox, with his other two brigades, followed later by Ames' division, started around Orton Pond, covering the Confederate right, to gain the Wilmington road in rear of the fort, the distance to be traveled being about 15 miles. The guns of Fort Anderson opened fire on the two brigades confronting the fort, and the gunboats opened heavily on the fort, the monitor Montauk lying close to it and the others enfilading its parapet. Gen. Hagood, warned by his cavalry of Cox's movement around his right, hastily abandoned Fort Anderson during the night, taking with him six light guns and falling back behind Town Creek, eight miles above the fort. Hoke also retreated from his lines opposite Fort Anderson to within four miles of Wilmington. By these movements Schofield gained possession of the main defenses of Cape Fear River and of Wilmington, with several pieces of heavy ordnance and a large amount of ammunition, and with but small loss. In this he had the assistance of the gunboats that moved up the river removing torpedoes and silencing batteries on both banks. On the 19th Cox pursued Hagood to Town Creek, behind which and near its mouth he was found intrenched and had destroyed the only bridge. The creek was not fordable and could not be bridged. Terry also advanced on the east side of the river, following Hoke, and

found him in force, and Ames' division was re-crossed to the east bank and joined Terry in the night. Terry again advanced on the morning of the 20th and after some sharp skirmishing came upon Hoke well intrenched with artillery in position. On the same day Cox crossed Town Creek below Hagood's position, by the use of a single flat boat found in the stream, which carried 50 men at a trip, and, by marching through woods and swamps, reached Hagood's flank and rear, attacked and routed his brigade, after a stubborn resistance, capturing two guns, three battle-flags, and 375 prisoners, including Col. Simonton, temporarily commanding the brigade, and nearly all the officers. During the night Cox rebuilt the bridge over Town Creek, crossed his artillery, and the next morning pushed on toward Wilmington without opposition. Terry was unable to make any farther advance, but occupied Hoke's attention, so that he could not send any part of his force to replace the losses in Hagood's brigade. On the 21st Cox secured a portion of the Confederate pontoon bridge across Brunswick River, which Hoke had endeavored to destroy, put the 16th Kentucky regiment onto Eagle Island abreast Wilmington and threatened to cross Cape Fear River above the town. Hoke at once set fire to steamers, boats, cotton, and naval stores, and abandoned the place, retreating in the direction of Goldsboro. Gen. Terry entered the place without opposition early in the morning of 22 February and pursued Hoke across Northeast River. Schofield reports that he took 51 heavy guns, 15 light ones, and a large amount of ammunition. The Union loss from 11 February to the capture of Wilmington on the 22d was about 200 killed and wounded. The Confederate loss is not definitely known, Schofield estimates it at not less than 1,000, in killed, wounded and prisoners. Consult 'Official Records,' Vol. XLVII.; Cox, 'March to the Sea'; Cox, 'Military Reminiscences of the Civil War,' Vol. II.

E. A. CARMAN.

Wilmington College, located at Wilmington, Ohio. It was opened to students in 1870, and chartered in 1875, under the auspices of the Society of Friends. It is open to women on equal terms with men. The college organization includes a preparatory school. Two full collegiate courses are offered, the classical, for which Greek is required, leading to the degree of A.B., and the scientific, leading to the degree of B.S.; a part of the work of the last two years is elective in both courses. A course in bookkeeping is included in the curriculum. The degrees of A.M. or M.S. are conferred for graduate work. There are six county scholarships, and three others; and a student loan fund. The campus consists of 23 acres, and is located in the eastern suburbs of Wilmington. The buildings include the main building, the observatory, South Hall (men's dormitory), the women's dormitory, the gymnasium, and the Auditorium. The library in 1910 contained over 6,000 volumes; the students numbered 190, of whom 42 were in the college.

Wil'mot, David, American jurist and politician: b. Bethany, Pa., 20 Jan. 1814; d. Towanda, Pa., 16 March 1868. He was admitted to the bar in 1834, and practised at Towanda. He was a member of Congress in 1845-51; was elected as a Democrat, but stood

in opposition to the extension of slavery into prospective new territory of the United States; and in 1846 he offered the famous amendment known as the Wilmot Proviso (q.v.). He supported Van Buren in 1848 against Cass, the regular Democratic candidate, and later joined the Republicans. In 1853-61 he was president-judge of the 13th district of Pennsylvania, in 1857 was an unsuccessful Republican candidate for governor of that State, sat in the United States Senate from 1861 to 1863, and from that time until his death served as judge of the United States Court of Claims.

Wilmot, John. See **ROCHESTER, JOHN WILMOT**, 2d EARL OF.

Wilmot, Robert Duncan, Canadian statesman: b. Fredericton, New Brunswick, 16 Oct. 1809; d. Oromocto, New Brunswick, 11 Feb. 1891. He was educated in Saint John, engaged for a time in shipping, and 1846 entered Parliament, where he sat for Saint John until 1861 and again in 1865-7. He was mayor of Saint John in 1849, surveyor-general of New Brunswick, and member of the executive council of the province in 1851-4, provincial secretary in 1856-7, and a delegate to the colonial conference in London, in 1866-7. He became a member of the Senate in 1865, of the privy council in 1878, was speaker of the Senate in 1878-80, and in 1880-5 was lieutenant-governor of New Brunswick.

Wilmot Proviso, an amendment offered in the United States Congress by David Wilmot (q.v.), 8 Aug. 1846, pending the consideration of a bill placing \$2,000,000 at the disposal of President Polk to negotiate a peace with Mexico. The amendment was as follows:

Provided, that, as an express and fundamental condition to the acquisition of any territory from the republic of Mexico by the United States, by virtue of any treaty which may be negotiated between them, and to the use by the executive of the moneys herein appropriated, neither slavery nor involuntary servitude shall ever exist in any part of said territory, except for crime, whereof the party shall first be duly convicted.

It was adopted in the House, and was under debate in the Senate when the hour arrived previously fixed for adjournment of the session. At the next session (8 Feb. 1847) Wilmot again introduced it, and a fierce and angry contest began. The House remained firm in favor of the amendment, and it was passed (15 February) by a decided majority, but was not acted on by the Senate. It caused great agitation throughout the country. The principle involved long continued to be an important factor in party politics, its influence being affected by many fluctuations of opinion and political action; and it may be said finally to have triumphed through the act of 19 June 1862 forbidding slavery in "any of the territories of the United States now existing, or which may at any time hereafter be acquired." Consult: Stephens, 'Constitutional View of the Late War Between the States' (1868-70); Wilson, 'Rise and Fall of the Slave Power' (1872-7); Schouler, 'History of the United States of America Under the Constitution' (new ed. 1899); Von Holst, 'Constitutional and Political History of the United States' (new ed. 1899).

Vol. 22 — 26

Wilson, Alexander, American ornithologist: b. Paisley, Scotland, 6 July 1766; d. Philadelphia, Pa., 23 Aug. 1813. In his 13th year he was apprenticed to a weaver, but after seven years abandoned the loom and adopted the life of a pedlar. Three years were thus spent and in 1789, having already prepared a volume of poems for publication, he offered his musings and solicited subscriptions for this work. It was published in 1790, but had little success; and he again returned to the loom. In 1792 he published 'Watty and Meg,' which, having appeared anonymously, was ascribed to Burns, though the style is very different. It is said to have had a sale of 100,000 copies in a few weeks. Having written a severe satire upon a person in Paisley Wilson was thrown into prison, and was afterward compelled to burn the libel with his own hand at Paisley Cross. Upon his release he came to this country, arriving at New-castle, Delaware, in 1794. He again resumed his former trade, but soon turned schoolmaster, acting in this capacity in several places in Pennsylvania. While thus engaged at Kingsessing, near Philadelphia, he became acquainted with William Bartram, the naturalist, and Alexander Lawson, an engraver, whose tastes and instructions stimulated his own talents. He had already undertaken long excursions for making ornithological researches, and devoted much time to the study, when he was engaged, in 1806, to assist in editing the American edition of Rees's Cyclopaedia, and now began to prepare for the publication of his 'American Ornithology,' the first volume appearing in 1808, and the seventh in 1813. The interval had been passed in exploring different parts of the country for the purpose of extending his observations, collecting specimens, and watching the habits of birds in their native haunts. In 1813 the literary materials for the 8th volume of the 'Ornithology' were ready, but its progress was greatly retarded for want of proper assistants to color the plates. Wilson was, therefore, obliged to undertake the whole of this department himself, in addition to his other duties; and these multifarious labors soon exhausted his strength and brought about his death. All the plates for the remainder of the 'Ornithology' having been completed under Wilson's own eye the letter-press of the 9th volume was supplied by his friend, George Ord, his companion in several of his expeditions, who also wrote a memoir of Wilson to accompany the last volume, and edited the eighth. Four supplementary volumes, containing American birds not described by Wilson, were published by Charles Lucien Bonaparte (1825-33). An edition of the original work, with Bonaparte's continuation, and notes and life of Wilson by Sir William Jardine, was published in London in 1832. Wilson continued to write poetry after leaving Scotland, one of his chief productions being 'The Foresters,' a poem describing a pedestrian tour to the Falls of Niagara, and several collective editions of his poems have appeared. A bronze statue of Wilson has been erected at Paisley.

Consult: 'Life of Wilson,' by Peabody, in Sparks' 'Library of American Biography' (1834-56); Brightwell, 'Difficulties Overcome: Scenes in the Life of Alexander Wilson' (1860); Paton, 'Alexander Wilson, the Ornithologist' (1863).

WILSON

Wilson, Allen Benjamin, American inventor: b. Willet, N. Y., 18 Oct. 1824; d. Woodmont, Conn., 29 April 1888. He was a cabinet maker by trade, but in 1849 invented a sewing machine which made a stitch at each movement of the shuttle, thus enabling the operator to make an endless seam at any curve, and thereafter devoted himself to its improvement. In 1851 he secured a patent for the rotating hook, and a year later invented the four-motion feed, which was subsequently adopted in all machines. In 1860 he entered into partnership with Nathaniel Wheeler (q.v.), with whom he established, at Bridgeport, Conn., the then largest factory in the world for the manufacture of sewing-machines. In 1852, however, on the reorganization of the firm, he withdrew from the business and settled in Waterbury, where he engaged in other enterprises. See *SEWING MACHINES*.

Wilson, Alpheus Waters, American bishop of the Methodist Episcopal Church, South: b. Baltimore, Md., 5 Feb. 1834. He was educated at Columbian College, Washington, D. C., was received into the Baltimore Methodist Conference in 1853, and on the organization of the Baltimore Conference of the Methodist Church, South, identified himself with that body. He became the secretary of the board of missions of his Church in 1878 and was elected bishop in 1882.

Wilson, Sir Archdale, English soldier: b. Didlington, Norfolk, 1803; d. London 9 May 1874. He entered the Bengal Artillery in 1819; distinguished himself at the siege of Bharrpur 1825-6, and took part in the Sikh war 1848-9. At the outset of the Sepoy revolt in May 1857 he was the earliest officer to encounter the Sepoys in battle, defeating them on May 30 and 31, and succeeding to the command of the force before Delhi in July, held his position until 24 September, when the city was taken. He was rewarded for his services with a baronetcy, was promoted major-general, made lieutenant-governor in the following March, and took part in the siege and capture of Lucknow 19 March 1858.

Wilson, Augusta Jane Evans, American novelist: b. Columbus, Ga., 8 May 1835. She was married to L. M. Wilson of Mobile in 1868. Her writings include: 'Inez, a Tale of the Alamo' (1856); 'Beulah', the most popular of her novels (1859); 'Macaria' (1864); 'St. Elmo', parodied by Webb in 'St. Twel'mo' (1866); 'Vashti' (1869); 'Infelice' (1875); 'At the Mercy of Tiberius' (1887); 'A Speckled Bird' (1902). The earlier books had a great popularity. They attempted to be massive, but contained no permanent elements, though attaining at times some power of expression. The later volume, written in the same manner, did not obtain recognition.

Wilson, Sir Charles Rivers, English financier: b. London 1831. He was graduated from Oxford in 1851, became a treasury clerk in 1856, was private secretary to Disraeli 1867-8, and comptroller-general of the National Debt Office 1874-94. He became one of the British administrators of the Suez Canal in 1876 and was finance minister to the Khedive of Egypt 1877-9.

Wilson, Sir Daniel, Canadian archaeologist: b. Edinburgh 5 Jan. 1816; d. Toronto, Ont., 7 Aug. 1892. He was educated at Edinburgh

University, and on leaving college entered with earnestness into antiquarian pursuits, and published in 1847, 'Memorials of Edinburgh in the Olden Time.' It was followed by 'Oliver Cromwell and the Protectorate' (1848) and 'The Archaeology and Prehistoric Annals of Scotland' (1851). At this time he was secretary of the Scottish Society of Antiquaries, but in 1853 was called to fill the chair of history and English literature in the University of Toronto. While resident in Canada he published 'Prehistoric Man' (1862, revised 1876); 'Chatterton, a Biographical Study' (1869); 'Caliban, the Missing Link' (1873); 'Spring Wild-Flowers' (1875), a volume of poems; 'Reminiscences of Old Edinburgh' (1878); 'Anthropology' (1885); 'The Right Hand: Left-handedness' (1891). In 1881 he became president of Toronto University, a position which he held until his death. In recognition of his services to education and literature he was knighted in 1888.

Wilson, Florence, commonly known by the Latinized form of his name, *FLORENTIUS VOLUSENIUS*, Scotch theologian: b. near Elgin about 1500; d. Vienne, Dauphiny, France, 1547. He was educated at King's College, Aberdeen, became a member of the household of the learned Cardinal du Bellay, archbishop of Paris, and was appointed by Cardinal Sadolet master of the public school of Carpentras. Here he wrote his famous dialogue 'The Tranquillity of Mind' (1543), much prized for its classical erudition and the beauty of its Latin style.

Wilson, Floyd Baker, American lawyer and author: b. Watervliet, N. Y., 23 June 1845. He was graduated from the University of Michigan in 1871 and from the Cleveland Law College (now Adelbert University) in 1873. Admitted to the bar in 1873, he practised in Cleveland till 1880 and since the year last named in New York, making a specialty of corporation law. He is the author of 'Uphill,' a novel (1880); 'Paths to Power' (1901) and has translated 'La Coja y el Encogidlo' (1901).

Wilson, Francis, American actor: b. Philadelphia, Pa., 7 Feb. 1854. He made his first appearance on the stage in a minstrel company, his debut in regular comedy occurring at the Chestnut Street Theatre, Philadelphia, in 1877. He played in various parts with much success and made his initial appearance in comic opera as Sir Joseph Porter in 'Pinafore.' He later became leading comedian in different New York theatres and afterward organized his own company, himself playing the leading comedy roles. He has published, 'The Eugene Field I Knew'; 'Recollections of a Player'; and 'Going on the Stage'; 'Joseph Jefferson' (1906).

Wilson, George, Scottish chemist, brother of Sir Daniel Wilson (q.v.): b. Edinburgh 21 Feb. 1818; d. 22 Nov. 1859. He was educated at the Edinburgh University; became a popular lecturer on chemistry and in 1855 was appointed professor of technology in Edinburgh University. Among his scientific works were 'Text-book of Chemistry' (1850); 'Researches in Color-blindness' (1855); and 'The Five Gateways of Knowledge' (1856), a delightful hymn or prose-poem of science.

Wilson, Harry Leon, American novelist: b. Oregon, Ill., 1 May 1867. He has edited 'Puck' from 1896 and is the author of 'Zig

WILSON

Zag Tales (1896); *The Spenders* (1908); *The Lions of the Lord* (1908).

Wilson, Henry, American statesman: b. Farmington, N. H., 16 Feb. 1812; d. Washington 22 Nov. 1875. His name was originally Jeremiah Jones Colbath, legally changed to Henry Wilson on his reaching manhood. He was a farm apprentice in his native town till the age of 21, when he moved to Natick and learned the shoemaker's trade. After two years' work at this business he had accumulated a small sum of money, which enabled him to attend the academies at Stafford, Wolfborough, and Concord. But the loss of some of his money forced him to cut short his plan for an education, and he returned to his work at Natick in 1838, and finally built up a prosperous shoe factory. In 1840 he took an active part in the presidential campaign in behalf of the Whig party, and in the same year was elected to the lower house of the Massachusetts legislature, was re-elected. In 1848 he withdrew from the Whig party to State senate. At this time he became known as an active opponent of slavery, and in 1845 was selected with J. G. Whittier (q.v.) to present to Congress the anti-slavery petition from Massachusetts against the annexation of Texas. In 1848 he withdrew from the Whig party because of its rejection of anti-slavery resolutions, and took a prominent part in organizing the Free Soil party, purchasing and editing the *Boston Republican* in the interests of that party. In 1850 and 1851 he was elected to the State senate, and was president of that body during both terms. In 1852 he was president of the Free Soil National Convention, and chairman of the national committee; and in 1853 was a member of the Massachusetts Constitutional Convention. In 1855 he was elected to the United States Senate, and shortly after taking his seat made a speech advocating the repeal of the fugitive slave law and the abolition of slavery in the District of Columbia and in the Territories. For a time in 1855 he was associated with the American party; but on its adoption of a pro-slavery platform he withdrew from it and took an active share in organizing the Republican party on the basis of opposition to the extension of slavery. In 1856 he denounced the assault of Brooks on Sumner, and was challenged to a duel by Brooks; though he refused the challenge, he stated that he believed in his right to defend himself if attacked. During the years of 1856-60 he took part in all important debates in the Senate; and his speech in defense of free labor, in reply to Senator Hammond of South Carolina was widely circulated in the Northern States. In January 1859 he was re-elected to the Senate by an almost unanimous vote of the Massachusetts legislature; and on the assembling of the Senate in 1861, was made chairman of the committee on military affairs, a post which the Civil War rendered one of great labor and responsibility. In this capacity he introduced and carried through Congress, during the extra session of 1861, the acts to authorize the employment of 500,000 volunteers, to increase the regular army, and to reorganize the military system. In 1865 he was a third time elected to the Senate, and took a prominent part in all the reconstruction measures, favoring the granting of full civil and political rights to the negroes, but also desiring a liberal treatment of the

Southern whites. In 1871 he was re-elected to the Senate, but resigned in the next year, when elected to the vice-presidency of the United States on the Republican ticket. In 1873 he suffered a stroke of paralysis from which he never fully recovered. At the time of his death he was engaged in writing the last volume of his *'History of the Rise and Fall of the Slave Power in America'* (1873-5), which he left partially incomplete. He also wrote: *'History of the Anti-Slavery Measures of the 37th and 38th United States Congresses'* (1865); *'Military Measures of the United States Congress'* (1866); *'Testimonies of American Statesmen and Jurists to the Truths of Christianity'* (1867); *'History of the Reconstruction Measures of the 39th and 40th Congresses, 1865-8'* (1868). Consult: Russell and Nason, *'Life and Public Services of Henry Wilson'* (1872); Stowe, *'Men of Our Times'* (1868).

Wilson, Henry Bristow, English Anglican clergyman: b. London 1803; d. Lee, Kent, 10 Aug. 1868. He was educated at Oxford, took orders in the Church of England and was one of the four Oxford tutors who in 1841 sent a protest to the editor of *'Tracts for the Times.'* He later became professor of Anglo-Saxon at Oxford, in 1851 vicar of Great Staughton, Huntingdonshire, and was one of the seven clerical authors of the famous volume of *'Essays and Reviews'* (1860); his contribution being *'The National Church.'* He was tried for heresy before the court of Arches but his sentence of a year's suspension from his benefice was reversed by the privy council. He was also the author of *'The Communion of Saints: An Attempt to Illustrate the Principles of Church Union'* (1851), the Bampton lecture contributed to *'Oxford Essays.'*

Wilson, Horace Hayman, English Orientalist: b. London 26 Sept. 1786; d. there 8 May 1860. Educated for the medical profession, in 1806 he went to Bengal as assistant surgeon in the service of the East India Company, but soon obtained an office in the Calcutta mint, of which he afterward became assay-master and secretary. His leisure was devoted to the study of Sanskrit, and so soon did he become known as an able Sanskrit scholar that in 1812 he was elected secretary of the Asiatic Society of Bengal. He acted for many years as secretary of the committee of public education, and his exertions contributed to revive the interest of the Hindus in their own literature as well as to create among them an interest in the science and literature of Europe. He remained in India till his election in 1832 to the Boden professorship of Sanskrit at Oxford University, and soon after his return to England was appointed librarian at the India House, and elected a fellow of the Royal Society. Among his numerous publications are: *'The Megha Duta, or Cloud Messenger,'* a Sanskrit poem, with an English translation, notes, etc. (1813); *'Sanskrit-English Dictionary'* (1819); *'Hindoo Theatre,'* select specimens translated from the original Sanskrit (1827); *'The Vishnu Purana—a System of Hindu Mythology and Tradition,'* translated from the original Sanskrit and illustrated by notes (1840); *'Grammar of the Sanskrit Language for the Use of Early Students'* (1841); *'Rig-Veda Samhita,'* translated from the original Sanskrit (1850-58), the last vol-

WILSON

umes being prepared by Cowell and Webster, after Wilson's death.

Wilson, James, American jurist: b. near Saint Andrews, Scotland, 1742; d. Edenton, N. C., 28 Aug. 1798. Educated at the universities of Glasgow, Saint Andrews and Edinburgh, he came to America in 1763 and settled in Philadelphia in 1766. After tutoring in what is now the University of Pennsylvania he studied law and was admitted to the bar in 1767. He sat in the Pennsylvania provincial convention in 1774 and in the Continental Congress 1775-7, 1782-3, and 1785-87, and was a signer of the Declaration of Independence. He served as delegate in the Constitutional Convention of 1787, taking a prominent part in the debates and later helping to secure the ratification of the Federal Constitution by Pennsylvania (1790). His speeches in these conventions have been highly commended for their profound comprehension of constitutional theory. In September 1789, he was appointed an associate justice of the United States Supreme Court and in 1790 became professor of law in the University of Pennsylvania. His writings include such important pamphlets as 'Considerations on the Nature and Extent of the Legislative Authority of the British Government' (1774); 'Address to the Citizens of Philadelphia' (1784). Consult his 'Works,' edited by his son, Bird Wilson (1803-4), and Andrews (1896).

Wilson, James, American globe maker: b. Londonderry, N. H., 1763; d. Bradford, Vt., 26 March 1855. Up to the age of 33 he was a farmer in his native place, at the same time reading and studying geography and astronomy. In 1796 he moved to Bradford, Vt., where he began experimenting with balls turned from blocks of wood and covered with paper. This rude beginning was followed by a much better method. The solid balls were thickly covered with layers of paper firmly pasted together, and this shell was then divided into hemispheres, which being removed were again united, and finished with due regard to lightness, strength and smoothness. He procured copper plates of sufficient size for his 13 inch globes, protracted his maps on them in sections, tapering as the degrees of longitude do from the equator to the poles and engraved them with such admirable accuracy of design, that when cut apart and duly pasted on his spheres, the edges with their lines, and even the different parts of the finest letters would perfectly coincide and make one surface, truly representing the earth or celestial constellations. He published his first globes in 1814. When past 80 he constructed a machine which illustrated the daily and yearly revolutions of the earth; the cause of the successive seasons; and the sun's place for every day of the year, in the ecliptic. These movements were produced by turning a crank, which caused the earth to revolve about the sun in the plane of the ecliptic, always retaining its true relative position. For want of a more definite name the machine was called Wilson's Planetarium. The large copper plate, on which are printed the months of the year, with their days, and the corresponding signs of the zodiac with their degrees, was engraved by Wilson after he was 63 years of age.

Wilson, James, American politician: b. Ayreshire, Scotland, 16 Aug. 1835. He came with his parents to the United States in 1852, and settled in Iowa in 1855. He was educated at Iowa College, engaged in farming in 1861, and in that year was elected to the State legislature, where he served for three terms, acting as speaker for the last two years. He was a member of Congress in 1872-7, State railway commissioner in 1877-83, and in 1883-5 was again a member of Congress. He was a regent of the State University in 1870-4, and in 1890-7 was director of the Agricultural Experiment Station and professor of agriculture at the Iowa Agricultural College, Ames, Iowa. He was appointed secretary of agriculture by President McKinley in 1897, was reappointed in 1901, and retained in office by President Roosevelt upon his accession to the presidency.

Wilson, James F., American politician: b. Newark, O., 19 Oct. 1828; d. Fairfield, Ia., 22 April 1895. He studied law, settled at Fairfield, Ia., in 1853, was elected to the convention for a revision of the State constitution in 1856, sat in both houses of the State legislature, and was president of the senate in 1861. From 1861 to 1869 he was a member of Congress, where he was chairman of the judiciary committee and one of the managers of the impeachment of Andrew Johnson. In 1883 he was elected to the United States Senate, and in 1889 re-elected. He was made a commissioner for the Pacific railway.

Wilson, James Grant, American author: b. Edinburgh, Scotland, 28 April 1832. He was brought to this country in infancy by his father, William Wilson (q.v.), served in the Union army during the Civil War, and reached the rank of brigadier-general. After the war he settled in New York and has been president of the New York Genealogical and Biographical Society from 1884. Among his numerous publications are: 'Biographical Sketches of Illinois Officers' (1862-3); 'Love in Letters, Illustrated in the Correspondence of Eminent Persons' (1867); 'Life of Fitz-Greene Halleck' (1869); 'Sketches of Illustrious Soldiers' (1874); 'Poets and Poetry of Scotland' (1876); 'Centennial History of the Diocese of New York, 1775-1885' (1886); 'Bryant and His Friends' (1886); 'Commodore Isaac Hull and the Frigate Constitution' (1889); 'Life of General Grant' (1897); 'The Presidents of the United States' (1901); 'Thackeray in the United States' (1903). He was the editor (with John Fiske) of 'Appleton's Cyclopaedia of American Biography' (6 vols. 1886-9), and alone, of 'Memorial History of the City of New York' (1892-3).

Wilson, James Harrison, American soldier: b. near Shawneetown, Ill., 2 Sept. 1837. He was graduated from West Point in 1860, was promoted lieutenant in 1861, and was chief topographical engineer on the Port Royal expedition. He was brevetted major for conduct at Fort Pulaski, Ga., and subsequently was side-de-camp to General McClellan, participating in the battles of Antietam and South Mountain. In the campaign against Richmond and in the operations against Chattanooga and Knoxville he was assistant engineer and inspector-general of the Army of Tennessee, and in 1863 was made brigadier-general of volunteers, and

WILSON

brevet lieutenant-colonel of regulars for gallantry at Chattanooga. He was brevetted colonel for conduct at the battle of the Wilderness, and was engaged in the siege of Petersburg and in the Shenandoah campaign. In September 1864 he was transferred to the command of the cavalry of the Mississippi Division, took part in General Thomas' campaign in Tennessee and was conspicuous at the battles of Franklin and Nashville. In March 1865 he made a raid into Alabama and Georgia and in 28 days captured Selma, Montgomery, Columbus, and Macon, taking 6,800 prisoners, among whom was Jefferson Davis. He received brevet rank as brigadier- and major-general and in 1866 was mustered out of the volunteer service. He was appointed lieutenant-colonel in the regular army in that year, but resigned in 1879, and was subsequently engaged in railroad engineering until the outbreak of the Spanish-American war when he was appointed major-general of volunteers and was assigned to command a division in Porto Rico. He was retired with the rank of brigadier-general of regulars in 1901. In 1902 he represented the United States army at the coronation of Edward VII. He has published, with C. A. Dana, 'Life of General Grant' (1868); 'Life of Andrew Alexander' (1887); 'China, Travels and Investigations in the Middle Kingdom' (1887-1900).

Wilson, Jeremiah Morrow, American jurist: b. Warren County, Ohio, 25 Nov. 1828; d. Washington, D. C., 24 Sept. 1901. He received an academic education; was judge of the Court of Common Pleas of Fayette County, Ind., 1860-5; judge of the Circuit Court 1865-71, and member of Congress in 1871-5. After retiring from Congress he took up the practice of law in Washington, D. C., and during his professional career in that city was connected with numerous famous cases. Besides having acted as attorney for the Union Pacific Railroad and the Mormon Church, he was counsel in the court-martial of General Swain, and was connected with the "Alabama Claims" and the French "Spoliation" cases; etc.

Wilson, John, American colonial clergyman: b. Windsor, England, 1588; d. Boston, Mass., 7 Aug. 1667. He was educated at King's College, Cambridge; was made fellow there; studied law, but took orders; was minister of Sudbury, Suffolk; and having frequently been suspended as a Puritan, embarked with John Winthrop for America in 1630 and landed at Salem, Mass. At Charlestown he organized what afterward became the First Church of Boston, of which he was ordained pastor in 1632. He was opposed to the so-called "Antinomian heresy" of the time; was associated with John Eliot in missionary work among the Indians; and was chaplain to the force sent in 1639 against the Pequots of Connecticut. He published: 'Some Helps to Faith' (1625); a poem, 'Famous Deliverances of the English Nation' (1626); a Latin poem commemorating John Harvard; and 'The Day Breaking, If Not the Sun Rising, of the Gospel' (1647; new ed. 1865). He had, says Cotton Mather, "so nimble a faculty of putting his devout thoughts into verse, that he signalized himself by . . . sending poems to all persons, in all places, on all occasions."

Wilson, John, Scottish author, best known by his pseudonym "CHRISTOPHER NORTH": b. Paisley 18 May 1785; d. Edinburgh 3 April 1854. He was educated at Glasgow University and Magdalen College, Oxford, and while at Oxford was noted for his skill in boating, cricketing, and other athletic sports. Having at 21 come into a large fortune, he purchased the property of Elleray, on Windermere, and retired there to live at his ease, writing poetry, and engaging in field sports and occasional wild frolics, to which the exuberance of his animal spirits was ever impelling him. In 1812 he wrote the once-famed 'Isle of Palms.' Another poem, in dramatic form, 'The City of the Plague' (1816), was still more successful; but is now forgotten. Wilson's fame with posterity rests on his prose writings, and more especially his contributions to 'Blackwood's Magazine.' Among the numerous papers furnished by Wilson may be mentioned those celebrated ones on fishing, shooting, and kindred pursuits, produced under the well-known sobriquet of "Christopher North," and above all his renowned 'Noctes Ambrosianae,' a series of conversations on literary and general subjects, supposed to take place at certain convivial meetings held in Ambrose's Tavern by the contributors to the 'Magazine' and since reprinted separately. In 1820 he obtained the chair of moral philosophy in the University of Edinburgh, a post he occupied with credit for 32 years. In 1822 to 1824 he published three prose works of fiction, 'Lights and Shadows of Scottish Life'; 'The Foresters'; and 'The Trials of Margaret Lyndsay,' which are marked by pathos and beauty of description, but are far from being faithful transcripts of human nature, and degenerate at times into mawkish sentimentality. A government pension of £300 per annum was bestowed on him in 1851, and the following year he resigned his professorship. There is an incomplete edition of his works by Ferrier (12 vols., 1855-8), and a separate edition of the 'Noctes' by R. S. Mackenzie (3 vols., 1866). Consult 'Mémorial' by his daughter, Mrs. Gordon (1862); Saintsbury, 'Essays in English Literature' (1890); Mrs. Oliphant, 'William Blackwood and His Sons' (1897); Douglas, 'The Blackwood Group' (1897).

Wilson, John, Scottish missionary: b. Lauder, Scotland, 11 Dec. 1804; d. Bombay, India, 1 Dec. 1875. He was educated at the University of Edinburgh, went to Bombay in the service of the Scottish Missionary Society in 1828, and in 1835 transferred his labors to the mission work of the Free Church of Scotland. He established numerous schools; became vice-chancellor of the University of Bombay; contributed largely to the abolition of the practice of suttee; traveled all over India establishing missionary centres; and was universally honored and beloved by the natives, among whom he spent his life from the time he went among them with the exception of the years 1843-7. He founded in 1830 the 'Oriental Christian Spectator,' issued for 30 years, and was the pioneer of Christian periodicals in India. His linguistic ability was remarkable, and his contributions to literature included: 'The Parsi Religion' (1842); 'India Three Thousand Years Ago' (1857); 'Memoirs on the Cave-Temples of India' (1859); 'The Lands of the

WILSON

Bible Visited and Described (1867); and **'Indian Caste'** (1877). Consult George Smith, **'Life of Wilson'** (1878).

Wilson, John Mackay, Scottish author: b. Tweedmouth 1804; d. Berwick-on-Tweed 2 Oct. 1835. He edited for several years the **'Berwick Advertiser'** and was editor and principal author of the popular **'Tales of the Borders'** (1835-40). The latest edition, revised and enlarged to 24 volumes, appeared in 1869.

Wilson, John Moulder, American military engineer: b. District of Columbia 8 Oct. 1837. He was graduated from West Point in 1860, received rank as lieutenant in 1861 and subsequently served in the Manassas, Peninsular, and Maryland campaigns. He was conspicuous for gallantry at Gaines's Mills and at Malvern Hill in 1862, and in 1863 was promoted captain, subsequently serving in the engineer corps. In 1865 he was brevetted colonel of volunteers and both lieutenant-colonel and colonel of regulars for gallantry at the capture of Spanish Fort in Mobile Harbor, and at Fort Blakely. After the war he was in charge of various important engineering works under the government and in 1886-9 was superintendent of public buildings and grounds in the District of Columbia. He directed the completion of the Washington Monument, the construction of the Army Medical Museum and Library, and other public buildings and memorials. He was appointed superintendent of the Naval Academy in 1889; in 1897 was appointed chief of engineers with rank of brigadier-general and was retired at his own request in 1901. In 1902 he was appointed to represent the army at the coronation of Edward VII.

Wilson, John Timothy, American organizer: b. Riceville, Tenn., 29 Jan. 1861. He worked on a farm until 17, filled several positions on a railroad and in 1888 began the organization of the International Brotherhood of Maintenance-of-Way Employees, of which he has been president since its start. It has nearly 100,000 members, has secured increased wages, shorter hours, and improved working conditions, with but one strike on its records. Wilson published **'The Calcium Light'**, an account of this strike (on the Canadian Pacific, 1901).

Wilson, Richard, Welsh landscape-painter: b. Penegoes, Montgomeryshire, 1714; d. Llanberia, Carnarvonshire, May 1782. He went to London, and studied portrait-painting with Thomas Wright. He then practised his profession in London, at length went to Italy, and at Venice, Zuccarelli, the artist, persuaded him to devote himself wholly to landscape. After staying some time at Rome and Naples, where he acquired great reputation, he returned to England in 1756, and settled in the metropolis. He had for a while much employment; but was at length doomed to undergo indifference and neglect, and was glad to obtain the office of librarian to the Royal Academy in 1776. His taste was exquisite, and whatever came from his easel bore the stamp of elegance and truth. Among his best works are the **'Niobe'**, **'Ruins of the Villa of Maecenas'**, **'Phaethon'**, **'Snowdon'**, **'View of Rome from the Villa Madama'**. Two of his works are to be seen in the New York Metropolitan Museum.

Wilson, Sir Robert Thomas, English soldier and author: b. London 17 Aug. 1777; d. there 9 May 1849. He was educated at the Westminster and Winchester schools, volunteered for the war in Flanders in 1793-4, and was a member of the staff during the Irish rebellion of 1798. He served in Holland in 1799 and in 1800 was engaged under Abercrombie in Egypt. He served under Lord Hutchinson on a secret mission to the allied armies on the Russian frontier in 1806-7, and in 1808-10 commanded a Lusitanian legion and later a Spanish brigade in Spain and Portugal. He sat in Parliament for Southwark in 1818-31 and for his espousal of the cause of Queen Caroline he was dismissed from the army in 1821, but subsequently reinstated. He received promotion to full rank as general in 1841 and in 1842-9 was governor of Gibraltar. He was author of several works on military subjects, several of which were not published until after his death, when they were edited by his son-in-law, Rev. Herbert Randolph. They include: **'History of the British Expedition to Egypt'** (1802); **'Sketches of the Campaigns in Poland'** (1810); **'Military and Political Power of Russia'** (1817); **'Narrative of Events During the Invasion of Russia'** (1860); **'Diary'** (1861); etc. Consult Randolph, **'Life of Gen. Sir Robert Thomas Wilson'** (1863).

Wilson, Rufus Rockwell, American author: b. Troy, Pa., 14 March 1865. He was engaged in journalism in Pittsburg, Washington, and New York in 1883-91, and has published: **'Rambles in Colonial Byways'** (1900); **'Washington--The Capital City'** (1901); **'New York, Old and New'** (1902); **'Lincoln in Caricature'** (1903); etc.

Wilson, Theodore Delevan, American naval constructor: b. Brooklyn, N. Y., 11 May 1840; d. Boston, Mass., 29 June 1896. He served an apprenticeship in the Brooklyn navy yard and in 1861 was appointed a carpenter in the construction department of the navy. In 1866 he was appointed assistant naval constructor; subsequently he was engaged in the navy yards at Pensacola, Philadelphia, and Washington. In 1869-73 he was instructor in naval architecture and shipbuilding at the Naval Academy, Annapolis, Md., and in the last mentioned year was promoted to be naval constructor. He was chief constructor of the navy from 1882-93, when he resigned because of failing health, and was granted a two years' leave of absence, resuming his duties at the Boston navy yard in 1895. He was an honorary member of the Institute of Naval Architects of England, the first American to be elected to that body. He patented in 1870 the **'air-ports'**, since generally adopted in the navy and in merchant-ships, and in 1880 patented a bolt extractor which has since come into general use. During his service he designed the battleship **Maine**, the cruisers **Boston**, **Chicago**, and **San Francisco**, the gunboats **Concord**, **Bennington**, **Petrel**, and other vessels. He wrote **'Shipbuilding, Theoretical and Practical'** (1873), which was adopted as a text-book at the Naval Academy.

Wilson, Thomas, English Anglican prelate: b. Burton, England, 20 Sept. 1663; d. Isle of Man 7 March 1755. He was educated at Trinity College, Dublin, and was curate of Newchurch Kenyon, 1686-92. He then became

WILSON

chaplain to the Earl of Derby, who appointed him bishop of Sodor and Man in 1697. His episcopate lasted 38 years and is noted for his strict insistence upon his privileges as head of the ecclesiastical court. This occasioned frequent disputes with the governor of the Isle of Man and he was at one time imprisoned for two months. He was the author of 'Principles and Duties of Christianity' (1707), commonly called the Manx Catechism—the first book printed in the native tongue; 'The Knowledge and Practice of Christianity Made Easy to the Meanest Capacities' (1775); 'Short and Plain Instructions for the Better Understanding of the Lord's Supper' (1736); 'Sacra privata, Private Meditations, Devotions, and Prayers' (1800); 'Parochialia, or Instructions for the Clergy' (1788); 'Maxims of Piety and Christianity' (1789). He instituted a Manx translation of the Bible, completed 1772-5. Consult 'Lives' by Crutwell (1781); Keble (1847).

Wilson, William, American poet: b. Perthshire, Scotland, 25 Dec. 1801; d. Poughkeepsie, N. Y., 25 Aug. 1860. He edited the Dundee 'Review,' 1821-3, did newspaper work in Edinburgh, where he was a friend of the brothers Chambers, and coming to this country in 1833, established himself at Poughkeepsie as bookseller and publisher. His 'Poems,' edited by Lossing, appeared in 1870 and revised and enlarged editions in 1875 and 1884.

Wilson, William Dexter, American philosopher and Episcopal clergyman: b. Stoddard, N. H., 26 Feb. 1816; d. Syracuse, N. Y., 30 July 1900. He was graduated from the Harvard Divinity School in 1838 and took orders in the Episcopal ministry in 1842. In 1850-68 he occupied the chair of philosophy at Hobart College, resigning in the last mentioned year to become registrar and professor of moral philosophy at Cornell University. He was made professor emeritus there in 1886 and during the last years of his life was dean of Saint Andrew's Seminary at Syracuse. He published: 'Introduction to the Study of the History of Philosophy' (1872); 'First Principles of Political Economy' (1875); 'The Foundations of Religious Belief' (1883); 'Theories of Knowledge Historically Considered' (1889); etc.

Wilson, Sir William James Erasmus, English surgeon and philanthropist: b. London 25 Nov. 1809; d. Westgate-on-Sea, Kent, 8 Aug. 1884. He went through a course of hospital practice in Paris, where he became known to Cuvier and Geoffroy de St. Hilaire, later attached himself to the Aldersgate School of Medicine, and was engaged in 1831 as assistant to Dr. Quain, professor of anatomy in University College. His first work, 'Practical and Surgical Anatomy,' was published in 1838, followed in 1840 by the 'Anatomist's Vade Mecum.' About this time he determined to devote himself to dermatology, and soon became the acknowledged authority in that hitherto obscure branch of medical science. He became fellow of the Royal College of Surgeons in 1843, and president in 1871. In 1845 he was elected a fellow of the Royal Society. By the time he had reached his 50th year he had amassed considerable wealth, and he then began a series of public and private acts of munificence, founding a professorship of dermatology in the College of

Surgeons, the chair of which he filled for nine years, contributing £7,000 to Epsom Medical College, restoring the ancient church of Swanscombe, Kent, founding a chair of pathology at Aberdeen, subscribing liberally to the Royal College of Music, and to the Margate Sea-bathing Infirmary. He devoted much attention to Egyptology, was president of the Egypt Exploration Fund, and furnished £10,000 for the transport of the obelisk known as 'Cleopatra's Needle' from Alexandria to its present site on the Thames Embankment. In 1881 he was knighted. Besides many publications in his special science he published, 'Cleopatra's Needle, with Notes on Egypt and Egyptian Obelisks'; and 'The Egypt of the Past.'

Wilson, William Lyne, American educator and legislator: b. Jefferson County, Va., 3 May 1843; d. Lexington, Va., 17 Oct. 1900. He was graduated from Columbian College in 1860, and later studied at the University of Virginia. He served as a private in the Confederate army through the Civil War, and in 1865-71 was professor of ancient languages at Columbian College. He was meantime engaged in the study of law, in 1867 was admitted to the bar, and several years later began practising law in Charlestown, W. Va. He was elected president of the University of Virginia in September 1882 and in the same month was elected to Congress. In June 1883 he resigned his presidency of the university, but served continuously in Congress until 1894. He framed the Wilson Tariff Bill (see *Tariff*), but disapproved of the amendments it received in the Senate. In 1895 was appointed postmaster-general by President Cleveland, and from 1897 until his death was president of Washington and Lee University.

Wilson, Woodrow, American educator and historian: b. Staunton, Va., 28 Dec. 1856. Graduated from Princeton in 1879 he studied law in the University of Virginia, and practised at Atlanta, Ga., in 1882-3. After special studies in history and politics at the Johns Hopkins University (1883-5), he was an associate-professor at Bryn Mawr in 1886-8, in 1888-90 professor of history and political economy in Wesleyan University, and in 1890 was appointed to the chair of jurisprudence and politics at Princeton. Upon the resignation of President F. L. Patton (q.v.) in 1902, he was elected president of the university, the first layman so chosen. He contributed largely to periodicals on administrative and political subjects, and took high position as a scholar and author by a series of works, including: 'Congressional Government: A Study in American Politics' (1885), which gained for him recognition on both sides of the Atlantic, and in England was taken as authoritative on American institutions; 'The State: Elements of Historical and Practical Politics' (1885), a standard book; 'Division and Reunion 1829-1889' (1893); 'An Old Master, and Other Political Essays' (1893); 'More Literature, and Other Essays' (1896); 'George Washington' (1896); and 'A History of the American People' (1902). He was the Democratic candidate for Governor of New Jersey in 1910, and was elected by a plurality of 40,056. In 1912 he was nominated by the Democratic National Convention at Baltimore for President of the United States, and elected 5 November.

WILSON — WILSON'S CREEK

Wilson, N. C., town, county-seat of Wilson County; on the Atlantic Coast Line Railroad; about 42 miles east by south of Raleigh. It is in an agricultural region in which the chief products are cotton and tobacco. The principal manufacturing establishments are cotton and lumber mills, carriage factories, foundries, machine shops, tobacco works, and flour mills. The town owns the electric light plant and the waterworks. The three banks have a combined capital of \$210,000. There are public and private schools for both races. Pop. (1870) 2,126; (1900) 3,525; (1910) 6,717.

Wilson Bill, The, a tariff measure enacted by Congress in 1895, succeeding the McKinley Bill (q.v.) of 1890. The Wilson tariff bill was based on the cost of raw material rather than on the cost of production, and was passed in the interest of the manufacturer. By this bill wool was placed on the free list or was made free of duty.

Wilson College, a college for women, located at Chambersburg, Pa. It was established in 1870 under the auspices of the Presbyterian Church. The majority of the board of trustees are Presbyterians, and the college is under the special care of the Synod of Pennsylvania. The courses offered are a classical course leading to the degree of A.B., a musical course leading to the degree of bachelor of music, and an art course entitling the student to a diploma in art. Each course is four years in length; the work in all courses includes required and elective studies, the latter coming mostly in the junior and senior years. Bible study is required in all courses. History and theory of art and music are included among the regular electives of the classical course; and arrangements are made so that students can take technical art and music courses and at the same time do the full amount of work required for the A.B. degree. There are also preparatory, classical, art, and music courses. Gymnastic work is required for three years of the college course, and the outdoor sports of rowing, tennis, basketball, and hockey are encouraged. The students maintain three literary societies, one for the preparatory and younger students; membership in one of these societies is required. The college campus comprises 25 acres located in the suburbs of Chambersburg; the Conococheague flows through the grounds, affording opportunity for rowing and fishing. The buildings include Main Hall, Fletcher Hall, South College, Science Hall, the Dining Hall, the Gymnasium, Frank Thomson Music Hall, with a large auditorium, the infirmary, and Harmony Cottage. Tuition is free to ministers' daughters who live at the college. The library in 1910 contained 7,000 volumes, the students numbered 365, of whom 177 were in the classical course.

Wilson Law. See ORIGINAL PACKAGE.

Wilson's Creek, or Oak Hills, Battle of. After the battle of Carthage (q.v.) 5 July 1861, Col. Sigel retreated to Springfield. Gen. N. Lyon who, with 2,350 men, had left Boonville in pursuit of Gov. Jackson, was joined near Clinton, on the 7th, by Major S. D. Sturgis, with 2,500 men and pushing southward learned on the 9th that Gen. Jackson had defeated Sigel at Carthage and formed a junction with Gens. Sterling Price and Ben McCulloch, who were marching from the southwest, upon which he

made a rapid march to Springfield, to anticipate Confederate attack on that place. He arrived on the 13th, and, with Sigel's forces, his united command numbered about 6,200 men. He spent the latter part of July in drilling his troops and procuring supplies and sent many urgent but unavailing appeal to Fremont at Saint Louis for reinforcements. The Confederates under Price and McCulloch numbered over 8,000 men, poorly armed with shotguns and country rifles, and had followed Sigel as far as Cassville, about 50 miles from Springfield. Here reinforcements arrived, swelling their force to 11,000 men with 15 guns, and 31 July they advanced toward Springfield. Lyon heard of their advance on 1 August and marched out on the Cassville road to meet them, with about 6,000 men and 18 guns, hoping to attack the largest and most advanced force, drive it back on the others and strike them in detail. On the next day his advance met and had a lively encounter with Price's advance under Gen. Rains, at Dug Spring, and drove it back. After advancing several miles he returned to Springfield on the 5th and reported the condition of affairs to Fremont, that he was largely outnumbered and probably would be compelled to abandon Springfield and fall back to Saint Louis or into Kansas (see SPRINGFIELD). McCulloch had refused to support Price in the affair at Dug Spring and now refused to advance unless he was acknowledged as in supreme command. Price consented to serve under him and at midnight of the 5th McCulloch advanced hoping to surprise Lyon, but finding that he had gone followed and on the 6th went into camp on Wilson's Creek within ten miles of Springfield. As the Confederates showed no disposition to advance from Wilson's Creek, Lyon, on the 8th, proposed to make a night march and attack them at daylight next morning, from which he was dissuaded, but it was agreed to march on the night of the 9th and attack the Confederate left at daybreak of the 10th. After this plan had been agreed on Col. Sigel persuaded Lyon to permit him with his brigade of two regiments, a six-gun battery, and two companies of cavalry to make a flank march around the Confederate right and attack from the south, while Lyon with the remainder of his force should attack on the north. Sigel, with his 1,200 men and six guns, moved four miles down the Cassville road, and making a long detour to the left, at daybreak was within a mile of the Confederate rear. Meanwhile Lyon had marched from Springfield and at 4 A.M. struck the advanced picket of Rains' Missouri command, which gave the alarm, the Confederates turned out of their camps and prepared for action and at 5.30 A.M. one of the most stubborn battles of the war began. The point selected by Lyon for his main attack was on the south side of Wilson's Creek and was held by Gen. Price with about 3,200 Missourians including Guibor's and Bledsoe's batteries, reinforced later by Churchill's regiment and Woodruff's battery, both from Arkansas. On Price's right, north of the creek, was McCulloch's brigade; on McCulloch's left and rear and on the same side of the creek was Pearce's Arkansas brigade, while in Price's rear, on the south side of the creek, were Churchill's regiment and the cavalry commands of Green and Major.

Gen. Lyon, with about 4,000 infantry and cavalry and the two batteries of Totten and

WILSON'S RAID

Dubois advanced more than a mile, driving in the Confederate skirmishers to the main line, which was posted on a wooded ridge perpendicular to the creek and to the Union line of march. He made an attack and the Confederates on the right were driven from the crest to the foot of the ridge. At the same time Capt. Plummer, with 300 regular infantry and 200 Home Guards, moving on the left and beyond the creek, upon entering a cornfield was attacked by the 3d Louisiana and other parts of McCulloch's brigade and after a fierce fight was checked. Dubois' battery opened upon these Confederates from across the creek and drove them back in some disorder and Plummer was withdrawn. It was now 8 o'clock, there was a temporary lull in Lyon's front, save by an effort of Price to turn his right, which was repulsed, and meanwhile Sigel had become engaged. Sigel had gained the Confederate rear and when he heard Lyon's musketry, he put his guns in position, drove Churchill, Major and Green from their camps, while they were at breakfast, crossed the creek and marching to the Springfield and Fayetteville road, formed across it at Sharp's Farm, the Confederates that had retired before him joining Price. McCulloch now sent a battalion of mounted Missourians and some Texans, and a part of the 3d Louisiana against Sigel. Bledsoe's battery opened on his front, Reid's battery joined in the enflading fire, the Louisiana men charged and captured five of his guns, and he was driven from the field, pursued the way he had come by the Texas and Missouri cavalry, and his command broken and scattered, Sigel himself narrowly escaping capture. Col. Salomon, with 450 men, made a wide detour and reached Springfield in fair shape, but Sigel's command took no further part in the battle. The contest had been renewed by Price, and the Confederates now turned their entire attention to Lyon, and McCulloch's brigade and Pearce's Arkansas brigade were sent to reinforce Price. Lyon ordered up every available man to meet the shock he saw impending, and about this time Price made a determined advance in two lines which nearly covered Lyon's entire front. For an hour the fighting was desperate, with varying success, till at last the Confederate effort was exhausted and there was another lull. Nothing had been heard from Sigel, and Pearce's Arkansas brigade was coming up to the support of Price's right, and Lyon made disposition to meet the new danger. His horse had been killed under him, and himself wounded and stunned, but recovering and again mounted, he swung his hat and led a charge against the Confederate right, which was met by a severe fire, the charge was not checked and the enemy were driven back, but Lyon received a wound near the heart, endeavored to dismount from his horse, and as he fell into the arms of his orderly, almost immediately expired. Major Sturgis succeeded to the command and the contest was continued for a half hour, when the Confederates gave way a short distance to re-form and make another effort. This was soon made and resulted in a disastrous repulse, and the battle was ended. Taking advantage of this last repulse, Sturgis, against the advice of some of his officers, ordered a retreat and withdrew through the dense undergrowth of the woods in which the battle mainly was fought, and the Confederates, as one of their officers writes,

"were glad to see him go" and did not pursue. Lyon's dead body was left on the field; it was subsequently delivered by the Confederates and taken to Springfield where it was buried. When Sturgis reached Springfield he yielded the command to Sigel, who had arrived there before him. Next morning Sigel marched for Rolla, over 100 miles distant. McCulloch refused to pursue Sturgis from the field of battle, and Price, resuming command of the Missouri troops, on the next day took possession of Springfield. The Union force in the battle numbered about 5,400 officers and men. The Confederates had over 10,000 armed men on the field, but 3,000 of them took little or no part in the fight. As officially reported the Union loss was 223 killed, 721 wounded, and 291 missing; the Confederate loss 265 killed, 800 wounded, and 30 missing. The Union reports were not full and a revised statement gives 258 killed, 873 wounded, and 186 missing, an aggregate of 1,317. Col. Snead, Price's adjutant general, places the Confederate loss at 279 killed and 951 wounded, an aggregate of 1,230.

Consult: 'Official Records,' Vol. III.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. I.; Snead, 'The Fight for Missouri.'

E. A. CARMAN.

Wilson's Raid from Chickasaw to Selma, Alabama, and Macon, Georgia. After the defeat of Hood's army at Nashville (q.v.) 15-16 Dec. 1864, Gen. James H. Wilson proceeded to complete the organization of a cavalry corps, with which it was proposed to overrun the South, and destroy its railroads and manufacturing centres. Early in March 1865, 27,000 men had been gathered and organized, nearly all well mounted, finely equipped and brought to a high state of efficiency. Some of this force was detached for other duty. Wilson, who had been encamped along the north bank of the Tennessee River from Gravelly Springs to Waterloo Landing, crossed the river on 18 March and started from Chickasaw and Waterloo, on the 22d for a march through northern Alabama, his first objective point being Selma, a great manufacturing place. He had the three divisions of Generals Emory Upton, Eli Long, and E. M. McCook, aggregating 12,500 mounted men with 24 guns. He had also 1,500 dismounted men, who were to act as train guards till they could be mounted from captured horses. Gen. Sherman says it was the largest, most efficient and most powerful body of horse that had ever come under his command. It was not excelled by any body of cavalry in the army. Accompanying it was a small canvas pontoon train of 30 boats, hauled by 50 six-mule teams, and a supply train of 250 wagons which were sent back to the Tennessee as fast as they were unloaded. This train carried 45 days' rations of coffee, 20 of sugar, 15 of salt and 80 rounds of ammunition. Each man carried five days' light rations, with 100 rounds of ammunition, and five days' rations of hard bread and ten of sugar and salt were carried on pack animals. As the entire country near the Tennessee was nearly destitute of forage it was necessary to scatter the troops over a wide extent and march as rapidly as circumstances would permit. This, Wilson says, was rendered safe by the fact that Gen. Forrest's Confederate forces were at the time much scattered, some near West Point, Miss., 19

WILSON'S RAID

miles southwest of Eastport, while Roddey's forces occupied Montevallo, on the Alabama and Tennessee Railroad, nearly the same distance to the southeast. By starting on diverging roads the enemy was left in doubt as to the real object and compelled to watch equally Columbus, Tuscaloosa, and Selma. Therefore the divisions marched on different roads, but the objective point of each was Selma, distant 180 miles, and the average march of each division to reach it was 250 miles. The command moved southward in three columns and on the 26th reunited at Jasper, about 80 miles southeast of Tusculum, from which it crossed the two forks of the Black Warrior, and pushed for Montevallo, a centre of iron manufacture. Gen. Croxton's brigade was detached to move on Tuscaloosa, to burn bridges, factories and public stores, and rejoin the command in the vicinity of Selma. Iron-works and rolling mills were destroyed near Elyton and 31 March, after passing Montevallo a mile, Upton encountered Roddey, who disputed the road to Randolph. After two brisk engagements Roddey was driven back, losing 100 men, and was pursued by Upton, who occupied Randolph at dark. Here a courier was captured, with despatches to Forrest, showing that several columns were moving to join Forrest for the defense of Selma, and detachments were sent to check them. McCook was left at Randolph to guard the trains and rear, while Wilson, with the divisions of Long and Upton, on 1 April, rode straight for Selma, encountered and brushed away several detachments of Forrest's cavalry and at Ebenezer Church came upon Forrest in position, with the brigades of Roddey, Crossland and D. Adams, about 1,500 men, covering the two roads from Randolph by which Wilson had marched. Long's division and Alexander's brigade of Upton's attacked and carried the position in less than an hour, the Confederates retreating in great disorder toward Selma despite all of Forrest's efforts to rally them. At night the whole command bivouacked about Plantersville, 19 miles from Selma, after almost constant fighting during the day of 24 miles, during which Wilson had captured 3 guns and over 200 prisoners. Early in the day McCook, with Col. La Grange's brigade, had been ordered to march rapidly to Centreville, 40 miles distant, to seize and hold the bridge over the Cahaba, and to fall upon Jackson's Confederate cavalry division, which had thrust itself between the main body and Croxton. At daylight 2 April Wilson resumed his march and by rapid movement, without opposition, the troops were in sight of Selma and mostly in position by 4 P.M. The city had been sufficiently fortified, as was believed, against any possible cavalry attack. The works contained 24 bastions and a number of strong redans, with deep ditches, and an interior line of four detached forts. They were of semicircular form, nearly three miles in extent, with both flanks resting on the Alabama River, above and below the city. They mounted 32 guns and were held by Forrest, with about 4,000 veteran cavalry and some 2,000 Alabama militia, home guards and citizens, mostly old men and young boys. Wilson had obtained accurate plans of the works and of the ground in front of them. During the day these sketches were shown to all his general officers and the plan of attack explained, from

which it resulted that upon reaching the vicinity of the works, the various brigades went quickly into position, with great precision. At a given signal Long's division was to lead in the assault, supported by Upton, but before the signal had been given Long had become engaged and without waiting he ordered the charge, and in the gathering darkness his men went forward, under a severe fire of artillery and musketry, scaled the works and after a hand to hand encounter drove the Confederates from them and took many prisoners. Some of Upton's men joined in the fight. Gens. Forrest, Armstrong, Roddey and Adams escaped, with a number of men, under cover of darkness. A portion of Upton's division pursued on the Burnsville road until long after midnight, capturing 4 guns and many prisoners. Wilson had engaged and in support, 8,000 men. His loss was 44 killed, 277 wounded, and 7 missing. Forrest's loss in killed and wounded was less. It was one of the most remarkable feats ever accomplished by cavalry, and its result was the capture of 2,700 prisoners, many colors, nearly 2,000 horses, 104 field and siege guns and an immense quantity of ammunition. Wilson destroyed the arsenal, with 44 buildings, covering 13 acres, filled with machinery and munitions, powder works, 3 gun foundries, 3 rolling mills, and several machine shops, and large accumulations of quartermaster and commissary stores. On the 3d Upton's division was sent from Selma to open communication with McCook and Croxton, west of the Cahaba. McCook had found Jackson's cavalry between himself and Croxton, and after skirmishing with it at Scottville, had retired east of the Cahaba. Nothing was heard of Croxton and Upton, and McCook returned to Selma, on the 6th. Croxton made a wide detour to the west and south of Tuscaloosa, and then northward and eastward across Alabama into Georgia before rejoining the corps. Preparations were now made to march on Montgomery. It was necessary to prepare 900 feet of bridging to cross the Alabama River, which was running high, horses enough had been captured to mount the whole command, supplies in the country were abundant, and on the 9th the entire command, except Croxton's brigade, started for Georgia by way of Montgomery. When the advance, which had not been strongly resisted, was near Montgomery, on the 12th, the mayor surrendered the city, Adams, who was in command having retreated, after burning 90,000 bales of cotton. With bands playing and colors flying the column marched through the city and encamped. Here five guns, a large quantity of stores, small arms and cotton were destroyed, also five steamboats loaded with military supplies. On the 14th the command moved with the greatest celerity to secure the crossings of the Chattahoochee at Columbus, on the direct road to Macon, and West Point, further up the river. On the afternoon of the 16th Upton's division, in the advance on the Columbus road, struck Buford's cavalry pickets and drove them rapidly through Girard to the lower bridge over the Chattahoochee. The bridge was fired by the Confederates before it could be seized, and it was then decided to make a night attack upon the central bridge, one of the three that crossed the river at this point. Three hundred men of the 3d Iowa cavalry, properly supported, were

WILTON—WILTS

selected to make the attack. The lines were quietly formed and moved up to within range of the intrenchments covering the bridge and at a signal the attack began at 9 p.m.; the troops opened a rattling fire from their Spencer rifles, which was replied to by a storm of canister from 27 guns, but the Iowa men went over the works at many points and all rushed for the bridge. At the same time the Confederates tried to escape by the bridge, which was so crowded with the men of both forces that the Confederates holding the works at the east end of the bridge and commanding it with two guns, were restrained from firing and the Union forces made a rush upon them and gained possession, and Columbus was taken. Wilson's loss was 6 killed and 24 wounded. He captured 1,200 prisoners, nearly half of the militia that had defended the place under command of Gen. Howell Cobb and Robert Toombs. Columbus was one of the great manufacturing centres of the Confederacy, and its capture resulted in the destruction of a great quantity of war material, 63 guns, the ram Jackson, mounting 6 guns; 125,000 bales of cotton, 15 locomotives, 250 cars, a navy yard and armory, 2 rolling mills, powder magazines and an arsenal, with a great quantity of machinery, 2 iron-works, 3 foundries, and 10 mills and factories turning out war material. The Confederates abandoned and burned the gunboat Chattahoochee 12 miles below Columbus. On the same day that Wilson captured Columbus, La Grange's brigade captured West Point. La Grange had been detached at Tuskegee and marching northeast, after some sharp skirmishing, appeared before West Point about 10 a.m. of the 16th to find that the bridge spanning the river was defended by an earthwork, mounting 3 guns, and held by Gen. R. C. Tyler, with about 265 men. The fort was taken after a hard fight, during which La Grange's men bridged the ditch of the work, under fire. Gen. Tyler and 18 of his men were killed, 28 wounded, and 218 captured. La Grange had 7 killed and 29 wounded. The captures were 3 guns, 500 stands of small arms, 19 engines and 245 cars loaded with army supplies. After destroying the bridges, railway equipment and stores, La Grange moved toward Macon. With the main column Wilson also marched for the same place on the 18th and when nearing the city, on the 20th his advance was met by a communication from Gen. Beauregard, with information of a truce between Gens. Johnston and Sherman. Before the communication could reach Wilson, who was marching near the rear of his column, his advance had dashed into Macon and received the surrender of Gens. G. W. Smith, Howell Cobb and other prominent officers, and these, with the garrison, were held as prisoners of war. Here Wilson heard of the surrender of Gen. Lee, and next day, 21 April, he received a despatch from Gen. Sherman, to suspend hostilities until notified of the result of the negotiations then pending between Sherman and Johnston. The surrender of Macon included four generals, 3,500 men, 5 colors, 60 guns, a large number of small arms, and great quantities of military stores and supplies.

Croton, who had been detached from McCook's division at Elyton, on 27 March, rejoined the corps at Macon 1 May. He had captured Tuscaloosa and advanced as far as Bridgeville,

then returned to Tuscaloosa and Jasper, thence his line of march was 100 miles north of that pursued by Wilson, and on the way through Alabama he had a sharp engagement at Blue Mountain, near Talladega. He marched 633 miles, most of the time through a mountainous country, so destitute of supplies that his command could be subsisted and foraged only by the greatest efforts. Swimming four rivers, destroying five large iron-works—the last in the cotton States—three factories, numerous mills, immense quantities of supplies, capturing four guns and several hundred small arms, and near 300 prisoners, he rejoined the corps, with men and horses in fine condition. He lost in all 172 officers and men. The closing act of Wilson's campaign was the capture of Jefferson Davis by regiments from his command.

In the campaign Wilson had marched 535 miles, captured five fortified cities, 288 guns, 6,820 prisoners, and 23 colors. He subsequently paroled over 59,000 officers and men of the armies of Lee, Johnston, and Beauregard, and had destroyed a vast amount of property of every kind. He lost 99 killed, 598 wounded, and 28 missing, an aggregate of 725.

He had conducted the most notable cavalry movement of the War, none other equaled it in skilful planning, bold and successful execution. Consult: 'Official Records,' Vol. XLIX.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.; Cox, 'The March to the Sea'; Platt, 'Life of Gen. Geo. H. Thomas'; Boynton, 'Gen. Geo. H. Thomas at Nashville.'
E. A. CARMAN.

Wilton, Joseph, English sculptor: b. London 17 July 1722; d. there 25 Nov. 1803. He studied in Paris and in Rome, and while at Rome in 1750 won the gold medal awarded for sculpture by Benedict XIV. on the occasion of his jubilee. He returned to England in 1755 and in 1758 became director of the art gallery of the Duke of Richmond. He was one of the founders of the National Academy and one of its first exhibitors. His busts and monuments were in much demand, among the former being those of Bacon, Cromwell, Isaac Newton, Chesterfield, Chatham and other prominent characters. From 1790 until his death he was keeper of the National Academy.

Wilton, Maine, town in Franklin County; on the Maine Central Railroad; about eight miles southwest of Farmington. It was settled in 1789 and in 1803 was incorporated. It has lumber mills, trunk and carriage factories, creameries, woolen mills, and agricultural implement works. The educational institutions are Wilton Academy, public schools, and a school library. Pop. (1910) 2,143.

Wilton Carpet, a variety of carpet made similar to Brussels, excepting that the wire is flattened instead of being round, and has a groove along the upper surface, which acts as a director for the knife by which the loops are cut and the wire liberated.

Wilt, or Wiltshire, England, a southwestern county bounded on the north and northwest by the county of Gloucester, on the west by Somerset, on the south by Dorset and Hants, on the east by Hants and Berks; area 1,350 square miles. Capital, Salisbury. The north is principally a fertile flat, with scarcely any per-

WIMAN—WINATSHIPUM INDIANS

ceptible slope, except on the frontier where it begins to rise in the direction of the Cotswold Hills, and near the centre, where it is broken by a ridge of downs; the south, though presenting at a distance the appearance of an almost uninterrupted plain, has an undulating surface, broken by downs and intersected by some fertile and well-watered valleys. In this south division is Salisbury Plain, an elevated plateau, covered with a scanty herbage. On the plain are the megalithic remains of Stonehenge, situated about nine miles north of Salisbury, and those of Avebury, about five miles west of Marlborough. The chief rivers are the Bristol Avon, the Salisbury Avon, and its tributaries Bourne, Willy, and Nadder. Though the arable land is of considerable extent, the larger proportion of the surface is kept in pasture, devoted chiefly in the south division to the rearing of sheep, and in the north to cattle-grazing and the dairy. Wiltshire bacon and cheese are famous. The manufactures comprise woollen goods, for which the principal localities are Wilton, famous particularly for carpets, Bradford, Trowbridge, Westbury, etc.; excellent cutlery and steel goods at Salisbury, ropes and sackings at Marlborough, iron founding at Devizes. Pop. about 300,000.

Wim'an, Erastus, American mercantile agent: b. Churchville, Ontario, 21 April 1834; d. Saint George, S. I., 9 Feb. 1904. He entered the mercantile agency service in 1858 and in 1867 removed to New York, where he became interested in rapid transit schemes for Staten Island. He increased the number of steamboat trips between that island and New York from 15 to 65 a day, built the Arthur Kill bridge, and in 1902 secured congressional authority for the construction of a tunnel under New York Bay connecting New York, Long Island, and Staten Island. His later years were clouded by financial reverses and the frustration of his extensive plans for rapid transit. He wrote 'Chances of Success' (1893).

Wimbledon, wim'bl-dôn, England, a town of Surrey, southwest of London, of which it is practically a suburb, at the northeast extremity of the common of same name, which until 1889 was well known in connection with the shooting competitions of the National Rifle Association. It has a free library, alms-houses, three hospitals, and many fine residences, being a favorite residential locality. The common has an area of about 1,000 acres.

Wimborne, wim'bérn, or **Wimborne Minster**, England, a market-town of Dorsetshire, on the Wimar Allen River, near its confluence with the Stour, about seven miles northwest of Bournemouth. It is of historical interest in connection with its fine cruciform minster, the collegiate church founded by Edward the Confessor which succeeded the convent established by Saint Cuthburh, King Ine's sister, in 705. The minster exhibits various styles of transitional architecture from the Norman onward, has a central and a west tower, and contains several interesting features, including the tomb of Ethelred I., and a mediæval chain-library, one of the few in existence where the books are chained to the shelves. The grammar school in the town was founded in 1496. Pop. about 5,000. Consult: Yeatman, 'Wimborne Minster'

(1878); Perkins, 'Wimborne Minster and Christ Church Priory' (1899).

Wimodausis, The, a benevolent secret society, composed exclusively of the wives, mothers, unmarried daughters and unmarried sisters of Master Masons. It originated in Pittsburgh, Pa., in 1895. The object of the society is: "To promote friendship and a kindly interest in the welfare of the members, and to stimulate intellectual activity by an interchange of thought on all subjects which will tend to the mutual advancement of the wives, mothers, daughters, and sisters of Master Masons."

Wim'ple, or **Wimpel**, a covering of silk or linen for the neck, chin, and sides of the face, worn usually out of doors. It is still retained as a conventual dress for nuns.

Winamac, win'a-mák, Ind., county-seat of Pulaski County; on the Tippecanoe River, and on the Pittsburg, Cincinnati & Chicago Railroad; about 90 miles southeast of Chicago and 23 miles northwest of Logansport. It has considerable trade; the principal shipments are farm and dairy products. The principal public buildings are the court-house, four churches, and the public and parish schools. The two banks have a combined capital of \$50,000 and deposits (1903) \$140,650. Pop. (1890) 1,215; (1900) 1,684; (1910 est.) 1,800.

Winan'dermere. See **WINNEMERE**.

Winans, Ross, American inventor: b. Vernon, N. J., October 1796; d. Baltimore, Md., 11 April 1877. He went to England to examine English railroad systems in the interest of the Baltimore & Ohio Railroad; and after his return built the first locomotive used on that railroad. He also invented the camel-back locomotive and the eight-wheeled car, and established in Baltimore some of the largest machine shops in the United States. He was active in political matters prior to the Civil War and in 1861 was elected to the extra session of the Maryland legislature, but was imprisoned in Fort McHenry. He was author of several pamphlets on religious subjects and also of 'One Religion, Many Creeds' (1870).

Winans, Thomas DeKay, American engineer, son of Ross Winans (q.v.): b. Vernon, N. J., 6 Dec. 1820; d. Newport, R. I., 11 June 1878. He was taken into partnership by his father on coming of age, and was sent by him in company with his brother William to make contracts with the Russian government for furnishing and managing the equipment of a railroad between Moscow and Saint Petersburg. With Andrew M. Bostwick and Joseph Harrison he entered into a contract for \$3,000,000, and afterward was engaged in other lucrative contracts with Russia. Upon his return to the United States he became interested in invention, and with his father and brother invented a system of steam navigation known as the "cigar-ship"; a tubular adjustment for the feeding of young trout; and various other mechanical devices.

Winatshipum Indians, a small tribe of the Salishan stock of North American Indians, also known as Piskawus or Piskouse, residing on Wenatchee River (whence the name of the tribe) and the north branch of Yakima River in Kittitas County, Washington. They took part in the Yakima treaty of 1855, but do not live

WINCHELL — WINCHESTER

on the reservation. There are six smaller tribes or bands connected with them and speaking the same language.

Win'chell, Alexander, American geologist: b. North East, Dutchess County, N. Y., 31 Dec. 1824; d. Ann Arbor, Mich., 19 Feb. 1891. He was graduated from Wesleyan University, Middletown, Conn., in 1847, became professor of physics and civil engineering at the University of Michigan in 1853 and of botany and geology there in 1855. He served as State geologist of Michigan 1859-62, professor of geology in the Kentucky University 1866-9, director of the Michigan Geological Survey 1869-71, and chancellor of Syracuse University 1872-4. From 1879 till his death he was professor of geology and palaeontology in the University of Michigan. He lectured extensively and published 'Sketches of Creation' (1870); 'Geological Chart' (1870); 'The Doctrine of Evolution' (1874); 'Science and Religion' (1877); 'Preadamites' (1880); 'Sparks from a Geologist's Hammer' (1881); 'World-Life' (1883); 'Geological Studies' (1886); 'Walks and Talks in the Geological Field' (1886).

Win'chendon, Mass., town in Worcester County; on the Miller River, and on the Boston & Albany and Boston & Maine (Fitchburg Division) R.R.'s; 35 miles north-northwest of Worcester. It was settled in 1752, and incorporated as a town in 1764; the town includes the villages of Winchendon, Waterville, and Winchendon Springs. It is principally a manufacturing town; the chief manufactures are wooden-ware, wood-working machinery, toys, and cotton goods; there is a national bank with a capital of \$200,000, and a savings bank. It contains the New England Home for Orphan and Destitute Children; and has several elementary schools, and the Murdock High School established in 1865 with a school library of about 1,500 volumes, and occupying a fine building valued at \$100,000; there is also a public library. The town owns and operates the system of water-works. Pop. (1910) 5,678.

Win'chester, England, an ancient city, capital of Hampshire, situated on the right bank of the Itchen, 11 miles north of Southampton. The most important edifice is the cathedral; the oldest parts date from the 11th century, but the greater part of the main building was erected at various times from the 13th to the 16th century, William of Wykeham (1324-1404) having an important share in the work. It has a central tower without a spire and no other towers; length from east to west, 545 feet, width of the transepts 186 feet. The length of the nave, which has a beautiful interior, is 351 feet, height 86 feet; the transept contains several beautiful chapels and altars. Numerous monuments include the tombs of William Rufus, of Edmund, son of King Alfred, of William of Wykeham, Cardinal Beaufort, and of Izaak Walton; the shrine of Saint Swithun; etc. Other notable edifices and establishments are St. Mary's College (Winchester College or School, one of the great English public schools), founded by William of Wykeham in 1387, richly endowed and accommodated in a large range of buildings, of which the chapel, hall, and library are beautiful specimens of architecture; the guildhall; the old castle, which has been restored and assize courts built adjoining; a corn-ex-

change; barracks for 2,000 infantry; the hospital of St. Cross, founded in 1132, several other charitable institutions, a free library and museum, school of art, etc. The Abbey Gardens are very beautiful, and statues of Alfred the Great by Hamo Thornycroft, erected for the millenary of the king celebrated at Winchester in 1901, and of Queen Victoria by Alfred Gilbert, adorn the town. There are no manufactures or trade of any consequence. Winchester was called *Caer-Gwent* by the Britons, *Venta Belgarum* by the Romans—under whom it was an important place, with a Christian church—and *Wintanceaster* by the Saxons. It became the capital of England under the Saxons, when the country was united under the sway of Egbert, in the first half of the 9th century, and it retained this dignity till the middle of the 11th century, being a royal residence and place where parliaments met after this also. After the battle of Naseby it stood a week's siege by Cromwell. Pop. about 22,000.

Winchester, Ill., city, county-seat of Scott County; on the Big Sandy Creek, and on the Chicago, Burlington & Quincy Railroad; 45 miles west-southwest of Springfield, Ill. It was first settled in 1830. It is in an agricultural region for which it is the shipping point; it contains grain elevators, flour mills, a meat-packing establishment, and a plow factory; there are two private banks. It has a public high school. Pop. (1910) 2,000.

Winchester, Ind., city, county-seat of Randolph County; on the White River, and on the Grand Rapids & I. and the Cleveland, C., C. & St. L. R.R.'s; about 68 miles northeast of Indianapolis. It is in an agricultural region and in a natural gas belt. It has flour and lumber mills, brick and tile works, machine shops, and a number of repair shops. The educational institutions are a high school, established in 1804, public graded schools, and the Randolph County Law Library. The three banks have a combined capital of \$140,000. Pop. (1910) 4,266.

Winchester, Ky., town, county-seat of Clark County; on the Chesapeake & O. and the Louisville & N. R.R.'s; 18 miles southeast of Lexington. It is in an agricultural region, in the "Blue Grass" country. It has flour mills, spoke and rim factory, planing mills, and machine shops. The principal shipments are farm products and live-stock. The educational institutions are the Kentucky Wesleyan College (M. E. South), opened in 1866, and the public and private schools. The two banks have a combined capital of \$200,000. The town was incorporated in 1792. Pop. (1890) 4,861; (1900) 5,964; (1910) 7,156.

Winchester, Mass., town in Middlesex County; on the Boston & Maine Railroad; about eight miles north by west of Boston. In 1638 the place was known as Waterfield, which, in 1640, was changed to Charlestown Village. In 1642 it was called Woburn, and in 1850 the present name was adopted. It has many places of great beauty, and it is a favorite residential suburb for Boston. It has manufactories for watch hands, leather and felt goods. There are machine shops and grist mills. A part of "Middlesex Falls," a State park, which has an area of 3,020 acres, is in this town. It has a State Aviary, and a Home for Aged People.

The educational institutions are a high school, established in 1850, graded public schools, and a public library which contains about 14,000 volumes. There are two banks. Pop. (1900) 7,248; (1910) 9,309. Consult Hurd, 'History of Middlesex County.'

Winchester, Tenn., town, county-seat of Franklin County; on the Elk River, and on the Nashville, Chattanooga & Saint Louis Railroad; about 80 miles south by east of Nashville. It is near the foot of the Cumberland Mountains, in an agricultural region. The town has considerable mining and lumbering interests. It is a favorite health resort. The chief industrial establishments are lumber and planing mills, wagon and carriage factories, wood-working factories, marble works, flour mills, and machine shops. It has one bank with a capital of \$75,000. Pop. (1910) 1,400.

Winchester, Va., city, county-seat of Frederick County; on the Cumberland Valley and the Baltimore & O. R.R.'s; about 81 miles west by north of Washington, D. C. It is in an agricultural and stock-raising region and has considerable lumbering interests. It has flour and paper mills, lumber mills, woolen mills, glove factories, tanneries, and machine shops. The educational institutions are Valley Female College (M. E. South), opened in 1874; the Shenandoah Valley Academy, Fairfax Hall, the John Kerr High School (white), established in 1872; a high school for colored pupils, elementary schools for both races, and a public library. The principal public buildings are the court-house and the city-hall. There are National and Confederate cemeteries.

Fort Loudoun, built under Washington, and Washington's headquarters are of historic interest. Washington's occupancy of Winchester was in 1755, after Braddock's defeat. Washington was stationed here, in command of the colonial and British forces. During the Civil War, Winchester was for some time a battle centre. On 19 Oct. 1864 Sheridan left Winchester on his famous ride to Cedar Creek. Pop. (1910) 5,864. See WINCHESTER, BATTLE OF.

Winchester, Battle of. See ORANGE, BATTLE OF.

Winchester, Military Operations at and Near. Winchester was an important strategic point during the Civil War, and it is stated on good local authority that it was occupied or abandoned 68 times by the troops of both armies. It was held by the Confederates until 11 March 1862, when Gen. J. E. Johnston having retreated from Centreville and Manassas, Gen. "Stonewall" Jackson, under Johnston's orders, withdrew from the place and retired up the Shenandoah Valley, and the Union troops, under Gen. Banks, occupied it on the 12th. Gen. Shields, who had followed Jackson up the valley, with a division of Banks' command, fell back to Winchester and Jackson followed him as far as Kernstown (q.v.), four miles south of Winchester, where Shields attacked and defeated him on 23 March; Jackson again retreating up the valley, Banks following and finally taking up a fortified position at Strasburg. Jackson flanked Banks out of Strasburg by moving through Luray Valley and defeating Col. Kenly at Front Royal (q.v.) 23 May, and Banks retreated to Winchester closely pursued by Jackson.

Winchester, First Battle of.—Banks arrived in Winchester late on the 24th with about 8,000 men and 16 guns. Col. Donnelly's small brigade was put in position to cover the Front Royal and Millwood roads, and was supported by eight guns, judiciously placed on rising ground. Col. Gordon's brigade, on the right, held a low ridge running southwest from the town and west of the Valley turnpike, a little over half a mile from the suburbs. Its left rested on the turnpike and its right extended westward along the ascending ridge in front of Winchester. Skirmishers were thrown out in advance and guns were placed on either flank. Five companies of Michigan cavalry were held in reserve under cover of the ridge. Between Gordon and Donnelly was an interval of nearly a mile, which was filled by the principal part of Gen. Hatch's cavalry brigade and two guns. The line formed the arc of a circle, covering Winchester from the west around by the south to the east. Jackson confronted this position with 16,000 men and 48 guns, and with the main body lay close to Gordon, while Ewell, with two brigades which had marched directly from Cedarville on Winchester, bivouacked opposite Donnelly's position. Jackson's plan was to hold Gordon fast, throw Ewell upon Donnelly, and then move his main body around Gordon's right, and he expected to advance upon a disorganized and demoralized army. At dawn of the 25th Ewell advanced the 21st North Carolina and opened with his artillery, whose shells fell among Donnelly's men, as they were preparing coffee, and brought them to arms as they saw the Carolinians advancing in line across an open field upon the centre of the position crossing the Front Royal road. The North Carolina men met a severe front and flank fire from the stone fences, and as they fell back Capt. Best's guns threw canister into their disordered ranks and they left the field with a loss of 80 officers and men, including the two field officers with them. A Confederate officer says, "The slaughter was appalling and the survivors fled to the rear in the utmost confusion." Ewell now brought up two batteries, and an artillery duel ensued, which soon ceased as a heavy fog settled over the field. Ewell then made an unsuccessful attempt to turn Donnelly's right and then endeavored to turn his left and gain the Martinsburg road in his rear. The attempt was checked, Donnelly losing some ground, but at this moment he received an order to retreat, as Gordon had been driven from position and was in retreat through Winchester. Donnelly moved his three regiments and guns from the field in perfect order, under a heavy fire of shot and shell, and continued his retreat, keeping to the right of the Martinsburg road. He had made a successful resistance of over four hours against double his number, with trifling loss.

Jackson attacked Gordon's small brigade with six brigades, his attack beginning at daybreak, and being several times repulsed. Finally he got artillery in position and opened on Gordon's front and gradually worked his infantry toward the left. Then he moved two brigades around Gordon's right. Gordon detected the movement while it was in progress and changed position to meet it, pouring a destructive fire of musketry into the Confederate ranks, making great gaps in the line, without checking its advance; the gaps were closed and with almost perfect align-

WINCHESTER

ment the two brigades came on and flanking Gordon's two right regiments drove them back in some disorder. The five companies of Michigan cavalry were now brought up and as quickly swept away. At this juncture Jackson ordered forward his entire line of six brigades and Gordon ordered a retreat through Winchester, which was conducted in a manner to command Jackson's admiration. There was some confusion in the streets of the town, but once clear of it, Hatch's cavalry and the artillery covered the withdrawal, until the infantry was well on the Martinsburg pike. Jackson with his main body pursued five miles beyond Winchester and Banks continued his retreat to the Potomac, crossing it at Williamsport on the 26th. Banks' loss May 23-25, including Front Royal and the retreat from Strasburg to the Potomac, was 62 killed, 243 wounded, and 1,714 missing. Jackson's loss was 68 killed, 329 wounded and 3 missing. Jackson remained at and in the vicinity of Winchester until 31 May, when, his rear being threatened by the converging columns of Fremont from the west and McDowell from the east, he retreated up the valley and the Union troops reoccupied Winchester. Consult 'Official Records,' Vol. XII.; Allan, 'Jackson's Valley Campaign.'

During Lee's campaign against Pope the town was occupied by Gen. Julius White with a brigade of over 2,000 men. On the night of a Sept. 1862 White, under Gen. Halleck's order, spiked four heavy siege guns in the works and withdrew to Harper's Ferry; the Confederates occupying the place next day. The Confederates held the place in small force until 3 December, when, upon the advance of a Union column from Harper's Ferry, under Gen. Geary, they retired, and Geary occupied the town next day. Geary soon withdrew and the Confederates reoccupied and held the town until near the end of December, when it was again taken by Union troops under Gen. Milroy. Milroy fortified the place and occupied also Berryville and Romney, with outposts toward Strasburg and Front Royal. Harper's Ferry, Martinsburg, Williamsport and posts westward to Cumberland and New Creek were held by Union troops belonging to Gen. B. F. Kelley's command.

Winchester, Second Battle of.—When Gen. Lee began his preparations for the second invasion of Maryland, which culminated in the battle of Gettysburg, he turned his thoughts to the clearing of the Shenandoah Valley. At this time Winchester was held by Gen. Milroy, with the two brigades of Gen. W. L. Elliott and Col. Ely, numbering about 7,000 effective men. Col. McReynolds' brigade of 1,800 men was at Berryville. The main works defending Winchester were on a ridge north of the town and consisted of two forts known as the "main fort" and the "Star fort," mounting four 20-pounder Parrotts and two 24-pounder howitzers. Surrounding these were smaller works connected by rifle-pits. The expressed object in holding the place was to observe and hold in check the enemy in the valley, and to secure the Baltimore & Ohio railroad against depredations. Milroy was expressly instructed to undertake no offensive operations in force. On 7 June Gen. Lee began his operations in the valley by ordering Gen. Imboden, in the upper valley, to make a demonstration with his cavalry brigade on Romney

in order to cover the movement against Winchester and prevent the Union troops at that place from being reinforced by Kelley's troops on the line of the Baltimore & Ohio railroad. Gen. Jenkins' cavalry brigade was ordered to join Ewell's infantry corps near Front Royal. Both Imboden and Jenkins were in position by the 10th, and on that day Ewell set out from near Culpeper Court House for Winchester by way of Gaines' Cross Roads, Chester Gap and Front Royal, to Cedarville, which was reached on the 12th. Here, next day, Ewell detached Roder's division and Jenkins' cavalry brigade to move on Berryville and endeavor to capture McReynolds' brigade, but, warned by Milroy, McReynolds made good his retirement, with small loss, joined Milroy at Winchester on the night of the 13th, and was assigned to the Star fort, immediately north of the main work. On the same day Early's division marched on Winchester by Newtown and the Valley pike, while Edward Johnson's division moved upon the town by the direct road from Front Royal. The two divisions, driving in Milroy's outposts, were in position before Winchester on the evening of the 13th. For some days Milroy had felt the pressure from Confederate cavalry, but had no idea that Lee was threatening the valley until a prisoner taken in a skirmish on the Strasburg road, on the evening of the 13th, informed him that he was confronted by Ewell's corps and that Longstreet's was near. Fully recognizing the fact that an orderly withdrawal was impracticable, he resolved to act on the defensive, and, if not relieved, force his way through what might appear the weakest part of his lines. At night of the 13th Ewell ordered Early to attack the works on the north and west of the town next morning, while, as a diversion, Johnson demonstrated against the east and southeast. In the forenoon Johnson made his attack on the eastern side of the town, between the Millwood and Berryville roads, held by Col. Ely's brigade, and was repulsed by the 8th and 89th Pennsylvania, which charged Johnson's retreating troops, but were speedily driven back by fresh troops, and after some sharp fighting Johnson gained part of the town, but was quickly shelled out and made no further effort. West of the ridge on which the main forts were thrown up, and about 1,300 yards distant, is another parallel ridge, called Flint Ridge, where an isolated earthwork of slight strength had been thrown up to command the Pughtown and Romney roads. It was held by the 110th Ohio, a company of the 116th, and a regular battery, commanded by Lieut. Wallace F. Randolph, all under command of Col. J. W. Keifer. Early, leaving Gordon's brigade south of the town to engage Milroy's attention, moved with the remainder of his division to the left and west, then north, crossed the Romney road, and about 5 p.m., having gained Round Mountain, south of the Pughtown road, and put 20 guns in position, without being perceived, opened an unexpected fire on Keifer's work and soon silenced Randolph's battery, upon which Hays' brigade, in two lines, made a quick dash, and after a stubborn resistance carried the work, and captured the battery of six guns. Keifer, with a loss of over 40 men, withdrew under cover of the fire from the guns of the main works. This was followed by an artillery duel which was kept up until 8 p.m., during which Milroy with-

WINCHESTER

drew his detachments to his main works. Darkness ended the contest.

Milroy was now in a critical position. His cannon ammunition was nearly exhausted and he had but one day's rations for his men. At 9 p.m. he assembled his brigade commanders, and it was concluded to give up further effort to defend the place, to abandon all the artillery and wagons, and to force a way through the Confederate lines that night, taking with them only the horses, small arms and usual supply of ammunition. All the guns were spiked and the ammunition thrown into the cisterns. At 1 a.m. of the 15th Milroy, abandoning his sick and wounded, avoiding the town, moved silently through a ravine about a mile and struck the Martinsburg pike, which was followed cautiously, with many halts to close up the stragglers, for about three miles, when, about 3.30 a.m. Elliott's brigade, which was in the advance, was fired upon by Confederate skirmishers and it was soon ascertained that their main body was east of and very near the road. The retreat had been anticipated and intercepted. Under Ewell's order, Gen. Johnson had left one brigade to prevent Milroy from escaping toward the east, and moved with the remainder of his division by way of Jordan Springs to Stephenson's Depot, about five miles north of Winchester, to intercept the retreat in that direction. Just as Johnson's head of column reached the railroad, 200 yards from the Martinsburg pike, Milroy's men were heard coming down the road and Johnson formed his line on elevated ground in a woods east of the road and in a field south of and adjoining the woods. The greater part of his men were sheltered by a stone fence which bounded a railroad cut. As soon as Elliott took in the situation he formed line of battle with his three leading regiments to push back the Confederates and thus clear the way for the rest of the column to pass on toward Martinsburg. An hour's fight ensued with varying success, Johnson's right being forced back and his artillery silenced, but the left of his line held firm against all efforts to shake it. The main road being blocked, Milroy determined to try another, and directed the troops to fall back a short distance and turn to the right. Part of them did so, but the greater number filed to the left, leaving the Martinsburg road and taking that to Bath. The diverging columns could not be reunited. A part of the command, accompanied by Milroy, reached Harper's Ferry by way of Smithfield late in the afternoon. Those retreating on the Bath road made good their escape, crossed the Potomac at Hancock and rallied to the number of 2,700 at Bloody Run. The greater part of Ely's and McReynolds' brigades were captured. Johnson claims the capture of 2,300 men, 175 horses, and 11 colors. The capture of Winchester and defeat of Milroy gave the Confederates 28 guns, 300 loaded wagons, many horses, and 4,000 prisoners. The Union loss was 95 killed, 348 wounded, and 4,000 captured or missing. The Confederate loss was 47 killed, 219 wounded, and 3 missing. Consult: 'Official Records,' Vol. XXVII.; Doubleday, 'Chancellorsville and Gettysburg.'

On marching into Maryland Gen. Early left a small garrison at Winchester and after the return from Gettysburg Lee's army was encamped around the place until it fell back beyond

the Rappahannock. The town was not then reoccupied in force by Union troops, being only visited occasionally by small detachments from Harper's Ferry and Martinsburg. It was subject also to Confederate forays from the upper valley. In December 1863 Gen. Early was sent into the valley, and throughout the winter and early spring of 1864 kept his troops very active, occasionally making dashes into Winchester. On 29 Feb. 1864 Gen. Sigel was assigned to the command of the Union troops in the lower valley and soon thereafter Winchester was occupied as an outpost to Harper's Ferry and Martinsburg. Sigel was relieved by Gen. Hunter after the battle of New Market (q.v.), 15 May, and when Hunter was repulsed at Lynchburg and forced to retreat to the Kanawha Gen. Early moved down the valley, and driving everything out of it, encamped near Winchester, 3 July, preparatory to his attempt on Washington (q.v.). After his failure on Washington Early returned to the lower valley and being hard pressed from the east and north fell back toward Strasburg, at the same time sending Ramseur's division of infantry toward Stephenson's Depot, a few miles northeast of Winchester, to support his cavalry and check Gen. Averell's division of Union cavalry, advancing from Martinsburg. Averell defeated Ramseur at Stephenson's Depot (q.v.), 20 July, and followed him through Winchester. He was joined by Gen. Crook's division, on the 22d, Crook assuming command, and the two divisions of 11,000 men advanced to Kernstown on the 23d. Early returned, defeated Crook at the second battle of Kernstown (q.v.) 24 July, drove him through Winchester and across the Potomac, and reoccupied Winchester and Martinsburg. Early's successes called for a strong commander of the Union forces to oppose him, and Gen. Sheridan was selected. On 7 August when Sheridan assumed command, near Harper's Ferry, Early's army was concentrated west of the Opequon River, covering Winchester and Bunker Hill. Sheridan advanced from Hallowtown toward Winchester, on the morning of the 10th, and Early, abandoning Bunker Hill and Winchester, fell back to Strasburg to await reinforcements coming from Lee's army at Richmond. Sheridan followed to Cedar Creek on the 12th. Early's reinforcements arriving, Sheridan's infantry fell back to Winchester on the night of the 10th, the cavalry following next day. From Winchester Sheridan, on the 17th, fell back to Berryville, behind the Opequon, leaving his cavalry to cover the withdrawal. Wilson's cavalry division, Lowell's cavalry brigade, and Penrose's brigade of New Jersey infantry, 850 men, were ordered to cover the flank of the army in its march from Winchester to Berryville. The Jersey brigade was deployed along a small branch of the Opequon, south of and near Winchester, with dismounted cavalry on the flanks, the remainder of the cavalry massed near the town. Early had followed Sheridan from Cedar Creek and, in the afternoon of the 17th, his cavalry advance driving in the Union cavalry, was checked and held by the Jerseymen, until Wharton's division of infantry attacked their right, and Ramseur's their front, while Gordon's division advanced against the cavalry. Under this pressure the entire Union line gave way about dark and fell back to Summit Point. The Jersey brigade lost 97 killed and wounded and about 200 prisoners.

The cavalry had about 30 captured. Early again occupied Winchester and advanced to confront Sheridan at Halltown. For some days both parties were feeling each other's lines and suffering some losses, and 2 September, Gen. Averell, who had been guarding the crossings of the Potomac, south of Hancock, advanced through Martinsburg to near Bunker Hill, where he attacked and routed Gen. Lomax's cavalry division of two brigades, capturing 2 battle-flags, 55 prisoners, some wagons, and a herd of cattle, finally driving Lomax nearly into Winchester next day, but Averell, in turn, was driven back by Rodes' infantry division. On the 13th Gen. McIntosh, with five cavalry regiments and two guns, started from Sheridan's lines near Berryville, captured some prisoners, and on approaching Winchester caught sight of an infantry line and charged it, driving it to a piece of woods, which he surrounded, capturing the 8th South Carolina of Kershaw's division, with its battle-flag. The rest of Kershaw's division advanced and McIntosh fell back with his 143 prisoners. These minor encounters were followed on the 19th by the greatest battle fought at Winchester, which to distinguish it from other battles of Winchester is known as the battle of the Opequon (q.v.), in which Sheridan with 38,000 men defeated Early's 15,000 and drove him from Winchester up the valley, not again to return. From this to the close of the war Winchester remained in Union possession. See also *SHERMAN'S VALLEY, MILITARY OPERATIONS IN*. E. A. CARMAN.

Winckelmann, vīnk'el-mān, Johann Joachim, German archaeologist and art historian: b. Stendal, Prussia, 9 Dec. 1717, d. Trieste, Austria, 8 June 1768. He studied theology at Halle, spent several years as private tutor and schoolmaster and in 1748 was appointed by Count Heinrich von Bülow secretary in his library at Nöthnitz, near Dresden. In 1755 he joined the Roman Catholic Church, and through the efforts of the papal nuncio at Dresden was enabled to visit Rome. Here he became librarian to Cardinal Albani, an art connoisseur and collector, and gave the public his ideas on ancient art. The more important of his works are *'Geschichte der Kunst des Alterthums'* (1764); and *'Monumenti Antichi Inediti'* (1767-8); with various sets of letters on the remains at Herculaneum and Pompeii. He was recognized as the leading authority in Europe in the field to which he had devoted himself. In 1768 he revisited Germany, but at Munich a longing for Italy so overmastered him that he determined to return. Going by way of Vienna, he was well received there, and was presented to the Empress Maria Theresa, who bestowed rich presents on him. At the beginning of June he departed for Trieste, where, for the sake of the gold medals and valuables in his possession, he was murdered by a fellow-traveler, named Arcangeli. The robber was interrupted, and fled without securing any booty, but was subsequently taken and executed. A collective edition of Winckelmann's works was published (1808-20) and another (1825-9). Winckelmann is considered by all authorities as the founder of modern scientific archaeology, and his conception of the beautiful elicited Lessing's *'Laokoon'*. Consult: Justi, *'Winckelmann, sein Leben, seine Werke*

und seine Zeitgenossen' (1866-72); John, *'Biographische Aufsätze'* (1866); Vogel, in *'Allgemeine deutsche Biographie'*, XLIII. (1898).

Wind, a current of air established at certain times and places within the body of the atmosphere at large, and flowing during periods longer or shorter in certain general directions; such currents being occasioned chiefly by differences of temperature at different times or localities, and by variations in the production and condensation of watery vapor. The portion of the surface of the globe over which any particular wind, permanent or occasional, may extend, is comparatively small, as is consequently the tract of the entire aerial ocean resting on that surface that is involved. At all times, also, there are parts of the atmosphere that are sensibly at rest or calm; and such apparently motionless tracts of air are sometimes of very great extent. For a statement of the physical properties of the air, see *ATMOSPHERE*, and in reference to the mechanical principles of equilibrium, mobility, and disturbance of a fluid mass circumstanced as is the air, see *PNEUMATICS*. The atmosphere is held to the earth only by gravity, and the action of this force does not interfere with its fluidity or elasticity, nor with the effect of any pressures acting at points within it; so that its parts have entire freedom of motion about or among each other, and it is in every part sensitive to the slightest disturbing forces. Since, however, the globe with its aerial envelope is to be regarded as moving in unresisting space, and since the friction of the earth's surface upon the lowest stratum of air, and of the strata successively one upon another, has sufficed to communicate to the entire body the earth's own velocity, it follows that the atmosphere, if it were left at rest within itself, must partake of the earth's movements as perfectly as if it were a solid part of that body. The simplest of the disturbances affecting the atmosphere are the movements of "atmospheric waves" of greater or less magnitude and duration, but of two sorts, the daily and the occasional or irregular, the occurrence of which is shown by certain periodical or rare, but gradual variations of barometric pressure. From the nature of the medium, these waves are, as compared with those of water, on a vast scale. The indications of the barometers at stations scattered over a large area of country show that these waves move singly, and indicate their breadth, and the direction and rate of advance; a generally increased or maximum pressure showing at a given time the presence of the crest, while at distances on either side of this a minimum pressure shows the margins or accompanying troughs of the wave. Of daily atmospheric waves, or tides, there are two: (1) that due to attraction of the sun and moon, and which in periods and character is therefore similar to the oceanic tides, but which, its maximum effect on the mercury column not exceeding $\frac{1}{16}$ of an inch, cannot be a cause adequate to produce winds; (2) the heat tide, or elevation of a crest of air along a meridional line following the sun at no great distance, while the cooling on the opposite side of the globe occasions the advance of a corresponding line of depression, this tide having therefore for its period a solar day, and within that period but a single crest, instead of two opposite ones. Beside these pe-

WIND-FLOWER—WIND INSTRUMENTS

riodic fluctuations, there are occasional vast atmospheric waves, due perhaps to previous winds, or to great local disturbances of temperature, or to combinations of causes not yet understood. The disturbances by heat that give rise to ordinary periodical or irregular winds, are such as occur along certain latitudes, or as are local and irregular altogether. An increase of temperature equal to 50° F. dilates the air receiving it by only about one tenth of its volume. From the direct rays of the sun air absorbs heat chiefly near the surface of the earth, and yet slowly even here, the warming of the air being more largely due to secondary radiation from the heated surface of the land or water. The heat acquired within a given time is usually by a very gradual increase, and limited in amount. If the warming of the air is quite uniform over a large surface, the equilibrium between the affected and the surrounding bodies may be steadily adjusted and preserved, so that no wind shall result; and it is a common experience of the hot season that, though the air at a place may be intensely heated, or through many degrees within a few hours, yet no wind may occur. During subsequent cooling of the same body of air a wind is more likely to arise, and especially so if clouds form at no great distance. Very generally, however, the effect of heating a tract of air in excess over that around it, is to occasion expansion and diminution of density; the column of air so affected moves or flows upward, and while the effect of its momentum further relieves its lowermost portions of pressure, and diminishes the resistance they can oppose to the surrounding air, the ascending body, losing at considerable height its excess of heat, acquires the density of air at such elevation, and flows over or outward, increasing the weight and pressure of some or all the surrounding portions. The lateral equilibrium below is thus destroyed, and a double movement of the air established, the air flowing in from one or more directions below the heated space, and flowing out above. But the momentum acquired in some given direction by the air rushing into the affected space may predominate, and, the conditions of neighboring portions of air favoring, a wind may thus be established that shall blow far beyond the point of first disturbance, as well as successively affect portions of atmosphere further back of it, and also extend widely, continuing for a long time before equilibrium and calm are restored. As a well known fact, however, high or widely extending winds are more likely to arise just before or during storms in which a considerable body of watery vapor is condensed and precipitated from the air, and yet more likely to be felt chiefly after such storms. Winds are also known to be produced in consequence of rapid and great evaporation, and even during the rapid formation of belts or masses of cloud without rain. In all the great oceans, however, there are certain winds, called trade-winds, which always blow in the same direction, though with seasonal variations in the area over which they blow. These are cold currents of air constantly flowing in from the polar regions to replace the warmer and lighter air which is constantly ascending from the tropical belt, and which finds its way back, at first entirely through the upper strata of the atmosphere, to the regions in which the cold currents take their rise.

The direction of these winds, which is nearly due west, but slightly south or north, according as it is a northeast or southeast trade-wind, results from the axial rotation of the earth from west to east. The general character of the air-movement is twofold. There is a movement from the poles toward the equator, and a return movement from the equator to the poles. In low latitudes the latter takes place exclusively in the higher strata of the atmosphere, but in higher latitudes its effect is often felt on the surface of the earth. In these latitudes, then, the winds may be divided into equatorial and polar, the former being as a rule more or less westerly, the latter more or less easterly. The equatorial winds are distinguished in general by the highest temperature, the greatest degree of saturation, the most cloudy weather, the most frequent rainfall, and the lowest atmospheric pressure; and the polar by the lowest temperature, the least degree of saturation, the clearest weather, the least rainfall, and the highest atmospheric pressure. This explains why the southwest wind is that which brings the most rain, and why a falling barometer is as a rule a sign of approaching rain, and also why the barometer, as is well known, usually shows an upward tendency with an east wind. Certain winds have a seasonal character, being either confined to certain seasons of the year, as the harmattan of the Guinea coast and the eolian winds that blow from the north in summer in the eastern part of the Mediterranean, or changing their direction at certain seasons, such as the monsoons of the Indian Ocean. See METEOROLOGY.

Wind-flower, the delicate *Anemone nemorosa*, *A. quinquefolia*, and other members of this genus of the *Ranunculaceæ*, so-called because the ancient Greek name of some plant associated in Greece with the winds has been given to the *Anemone*, or because the little plants bloom when spring winds are rampant. The two species mentioned send up an early flowering stem, bearing about its centre a whorl of three digitately divided leaves; above them is a solitary white-petaled starry flower, often tinged with shell-pink on the outside. They expand fully only in sunshine, and nod with half-closed corollas on cold, dark days, and at night. The plants choose mossy stumps in swamps, or damp thickets for their habitat, and have large basal leaves later in summer. On the prairies the red wind-flower (*A. multifida*) and the pasque-flower (*A. patens var. nuttalliana*) bear this name. Another European wind-flower is *Gentiana pneumonanthe*, a low, blue-flowered marsh plant.

Wind Instruments, a general name for musical instruments played by the human breath, as the flute, the cornet, etc., or by artificially produced currents of air, as the organ, harmonium, etc., in all of which the vibrations of a column of air produce the sound. The wind instruments of an ordinary orchestra are usually divided into two classes: wood instruments and brass instruments; the organ or harmonium being classed apart. The woods, some of which are partially composed of ivory, are the piccolo, flute, flageolet, clarinet, basset-horn, oboe, and bassoon. Their tone is light, smooth, and soft, and almost vocal in its character, and can be produced in all the delicate

WIND SIGNALS—WINDLASS

crescendo and diminuendo shadings. The brasses comprise the cornet-a-piston, horn, trumpet, trombone, euphonium, bombardon, etc. Their tone is somewhat harder, and generally more powerful and majestic than that of the woods. Being fixed-toned instruments (except the trombone) they cannot, like the strings, play in perfect tune, and they can only produce one sound at a time. For the number of the wind instruments and their proportion to stringed and percussion instruments in an orchestra, see **ORCHESTRA**.

Wind Signals. See **WEATHER SIGNALS**.

Windage. See **PROJECTILES**.

Wind'ber, Pa., borough in Somerset County, on the Pennsylvania and the Johnstown Passenger R.R.'s; about eight miles east of Johnstown. It is in an agricultural and coal-mining region, and has extensive coal-mining interests. The Berwind White Coal Mining Company have 10 operations, in which are employed 5,000 persons. In the W. P. Kelley Brick Company works there are about 100 men; and in the planing mills and construction works of the Pennsylvania Lumber and Construction Company, about 80 men are employed. Other industrial establishments are a brewery, machine shops, coal, brick and lumber yards. The Lake Trade Coal Company, which has operations and large coal holdings at Hilliard, Butler County, has its home office in Windber. The borough is well laid out; it has wide streets paved with brick; and a number of fine buildings. There are three large public schools containing 20 rooms. One building was erected in 1903 at a cost of \$50,000. There are two banks; the Windber national bank has a capital of \$50,000. There are seven church buildings, one mission, and a strong Y. M. C. A. organization. The borough has a municipal hall. The government is vested in a burgess and a council of seven members. The expenses annually of the excellent volunteer fire department are \$10,000.

The Berwind White Coal Mining Company were chiefly instrumental in establishing the borough, by means of their extensive operations and coal holdings in the vicinity. Nearly all their employees reside in the borough. Windber was laid out for an industrial centre and an ideal residential town. The town was platted by J. S. Cunningham, and in 1900 it was incorporated as a borough. It has water-works, electric lights, and two newspapers. Pop. (1910) 8,013. About 75 per cent are foreign born.

AMOS CLAR,

Editor 'The Windber Era.'

Windbreak, in agriculture, rows of trees planted along the edge of fields of grain, orchards, etc., to break the force of the wind and to protect the crops.

Winder, win'dér, William Henry, American general: b. Somerset County, Md., 18 Feb. 1775; d. Baltimore 24 May 1824. He was graduated from the University of Pennsylvania and became a lawyer in Baltimore. In March 1812, at the breaking out of the War of 1812, he was appointed lieutenant-colonel of infantry, and was made colonel in July of the same year. He led a successful expedition from Black Rock to the Canada shore, 28 Nov. 1812; was promoted to be brigadier-general in March 1813; ap-

pointed adjutant and inspector-general in May 1814; commanded at the battle of Bladensburg, and the unsuccessful defense of Washington, in August 1814, and was honorably discharged in June 1815. He then resumed his law practice, and was subsequently a member of the Maryland senate.

Windermere, win'dér-mér, or Winander-mere, England, a lake in Lancashire and Westmoreland, about 11 miles in length, and from one third of a mile to a mile in width, its area being a little over five square miles; its depth varies from 30 to 240 feet. Its outlet is the river Leven, which discharges its waters into Morecambe Bay. The lake is surrounded by gentle, well wooded eminences, and the neighborhood is noted for its beautiful scenery, celebrated by the Lake poets, Wordsworth, Coleridge, and Southey. Wordsworth lived at Rydal Mount, about two miles from the head of the lake. Windermere, pop. (1901) 2,379, is a small town near the eastern shore.

Wind'galls, puffy swellings about the fetlock-joints of animals, particularly of horses, resulting from an increased secretion of synovia arising from work, particularly on hard roads; they are generally unassociated with any pain, heat, or lameness, and are not generally considered to be causes of unsoundness. If the horse be young they may disappear if the animal be allowed a long rest and the parts blistered once or twice. Old horses having windgalls are generally kept at work, the legs being bandaged when in the stable.

Windham, win'dám, William, English orator and statesman: b. London 3 May 1750; d. there 4 June 1810. He was educated at Eton, Glasgow, and Oxford, and was returned to Parliament as member for Norwich in 1784. During the early part of Pitt's administration he sat in the opposition, but during the course of the French Revolution joined Burke in condemning the revolutionary principles, and advocating the war that Pitt declared against France. He was secretary-at-war in Pitt's cabinet 1794-1801, and under the Fox and Grenville ministry, which came into office in January 1806, held the rank of colonial secretary. During his tenure of office, which continued till March 1807, he brought in and succeeded in passing against strenuous opposition, a measure for reducing the duration of the period of enlistment for soldiers, and making various provisions for improving the condition of the soldier. Windham was a man of thoroughly independent character, but his independence sometimes passed over into eccentricity. A collection of his speeches with a 'Life' by Amyot, was published in 1806; his diary, edited by Mrs. Baring in 1866.

Wind'hover, a name in Great Britain for the kestrel (q.v.), referring to its habit of holding a stationary position facing the wind, while it searches the ground beneath it for indications of prey.

Windlass, in mechanics, a machine for raising weights from a pit, consisting of a cylinder or roller moving on an axle supported on a frame, and turned by levers inserted in square holes cut in the cylinder, or by a crank fitted on to one or both ends of the axle. One end of a rope or chain is attached to the cylinder, and

WINDMILL

the other to the weight, which is raised by the rope being shortened in passing round the roller.

Windmill, a machine for furnishing power for grinding grain, pumping water, or doing other useful work, operated by the wind. History does not record the date of invention of the windmill; but it is known that it was used in Europe as early as the 12th century A.D. A common form of European windmill is shown in figure 1. The sails, upon which the wind

sends its edges to the wind, and is therefore not affected by it; a change in the direction of the wind tends to cause rotation of the auxiliary wheel which in rotating brings the main windwheel into proper relation with the wind. Before the invention of the auxiliary steering wheel, and to a large extent after its invention, the main windwheel was kept in position by hand. In many cases the whole tower, instead of merely the upper part thereof, is made to pivot about its vertical axis, this latter construction being generally followed in German practice, while that above described is common to machines built by the Dutch. In some very crude windmills of the European type no provision whatever was made for changing the direction of the windwheel. The speed of a windwheel tends to vary with the wind velocity. In windmills of the European type, where speed regulation is desired, it is accomplished by varying either the load or the sail area exposed to the action of the wind. A friction brake is often used to vary the load, while to vary the sail area the canvas forming the sail surface is rolled up or unrolled, or the sail surface is formed from slats, after the fashion of the Venetian blind, and changed by opening or closing the slats. The devices for varying the sail area are actuated either by hand or by a suitable automatic governor. It is to be observed that the sails of the European windmill occupy only a small portion of the area swept by them. In the American type the sails are much greater in number and occupy, comparatively, a much larger part of the area swept by them. The greater number of sails makes it possible to reduce the diameter of the windwheel, for a given power, considerably below that necessary in the European windmill; as a result the American windmill is much smaller than that of Europe. The windwheels of the latter were often as large as 100 feet in diameter; those of the American type are rarely larger than 30 feet in diameter.

FIG. 1.

acts in driving the machine, consist of a light framework upon which canvas is stretched. The surface of the canvas makes an angle (called the angle of weather) with the plane of the windwheel, and this angle is usually about 18° at the inner end of the sail, gradually decreasing to about 7° at the outer end. The length of the sail is generally about five sixths the length of the arm, the width of the outer end one third the length, and the width of the inner end one fifth the length. For proper action the axis of the windwheel shaft should be parallel to the direction of wind. In most cases it is, however, inclined upward at an angle of about 15° to permit the ends of the sails to clear the tower, and since the direction of the wind is, in general, horizontal, this condition for proper action is not fully realized in windmills of the European type. To allow the windwheel to be turned as the direction of the wind changes, the upper part of the structure is adapted to rotate about the vertical axis of the tower, being supported upon rollers at A, and the auxiliary wheel B is provided to maintain it in its proper relation with the direction of the wind. This auxiliary wheel is so connected, by gearing, with the fixed part of the structure that in rotating it causes the movable part of the structure to turn about its axis. When the main windwheel is properly directed the auxiliary windwheel pre-

FIG. 2.

American windmills are built in a very large variety of styles, some being constructed principally of wood, others entirely of metal. Each is, however, designed to automatically maintain

WINDMILL

the windwheel in its proper relation with the direction of wind, to deliver the power developed either by means of a rotating shaft or re-

lent churning of the water resulting from the rapid action of direct stroke windmills, and to reduce the losses in the pump due to friction and to backlash of the valves. When the windmill is to be used for general power purposes, which may include pumping, sawing, grinding, etc., the power is transmitted through a train of gears to a vertical shaft, those of this general type being known as geared, or power windmills. Any torque exerted by the gearing upon the vertical shaft reacts upon the windmill itself, tending to rotate it out of its normal position with regard to the direction of wind. Neglecting friction, the torque at the vertical shaft is equal to that exerted by the windwheel divided by the number of turns which the vertical shaft makes to one turn of the windwheel. Hence the effect of the vertical shaft in disturbing the position of the windwheel becomes smaller in amount as the ratio of gearing between them is increased, and for this reason the ratio of gearing is in best practice made about six to one; that is, the vertical shaft makes six revolutions to one revolution of the windwheel. This high ratio is also an advantage in that it allows the diameter of the vertical shaft, for a given size of windwheel, to be made considerably less than that which would be necessary with a smaller ratio.

When the pressure of the wind upon the windwheel becomes so great as to approach the danger point, it is lessened by reducing the sail area exposed to the wind. In the windmill shown in figure 2 the windwheel is so placed that a line drawn through its centre parallel to the



FIG. 3.

reciprocating rod, and to automatically keep its speed below a certain definite and safe limit. A certain number of methods have been devised for each of these operations. Different combinations of these methods, together with variations in minor details, result in the large variety of styles. Figures 2, 3, and 4 show several windmills of the American type, these particular forms being selected because among them may be found examples of each of the methods by which the results before mentioned are accomplished. The windwheel may be held in proper position with regard to the direction of wind in three ways, namely, by means of a rudder or tail, as in figures 2 and 3, by means of an auxiliary steering wheel, as in figure 4; and by the pressure of the wind upon the windwheel itself, which is placed on the opposite side of the tower to that from which the wind proceeds, as in figure 4. When the windmill is to be used for pumping purposes exclusively, the power is, in general, transmitted from the windmill to the pump by means of a reciprocating vertical rod, as in figures 2 and 3. Those in which the pump rod makes one complete stroke for each revolution of the windwheel, as in figure 4, are termed direct stroke windmills; when the pump rod makes only a fraction of a stroke for each revolution of the windwheel, as in figures 2 and 3, the windmill is said to be back geared. The back gearing may be accomplished either by means of a pair of spur gears, as in figure 2, or by means of a rack and pinion, as in figure 3. In pumping windmills of recent construction back gearing is very largely employed, its object being to avoid the great shocks and vio-

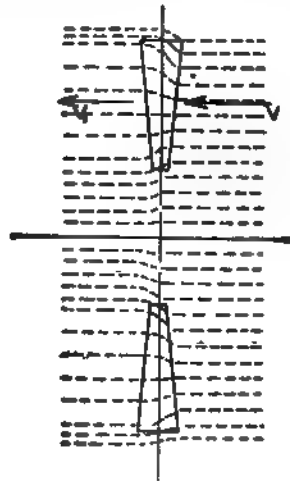


FIG. 5.

normal direction of the wind passes to one side of the axis about which the windmill pivots. The tail is in each case supported upon the windmill frame by the hinge joints C, C', and is held in its normal position with reference to the windwheel by the spring D. Wind-pressure upon the windwheel tends, therefore, to stretch the spring, and it does so when it is sufficient to overcome the initial tension of the spring, thus turning the windwheel so that the wind acts obliquely upon it, and reducing the exposed sail area. The initial tension of the spring is so determined that

WINDMILL

it will begin to stretch when the pressure of the wind upon the windwheel approaches the safe limit. In the windmill shown in figure 3 the windwheel is so placed that a line through its centre parallel to the normal direction of the wind intersects the axis about which the windmill pivots. The side vane E is fixed to the windmill frame, upon which the tail is also carried, being supported by the hinge joints, C, C'. The tail is held in its normal position with reference to the windwheel by means of the spring F. Pressure of the wind upon the vane E tends therefore to stretch the spring F, and the spring is so determined that it will be stretched when the wind pressure upon the vane E approaches the safe limit. As the spring is stretched the position of the windmill is changed so that the exposed sail area is reduced, in the same

posed sail area. Other methods of regulation, involving centrifugal governors or variations from the arrangements above described, have been devised, but have not come into extended use. The particular mechanical details involved are subject to very wide variation, but the arrangements shown in the figures serve to illustrate the principal types.

Windmills of the usual forms are, in general, mounted upon towers of heights ranging from ten to a hundred or more feet, so that the wind which acts upon them will not be seriously affected by obstructions which may exist in their immediate neighborhood. Provision is always made for controlling, or furling, the windmill from a convenient place near the base of the tower, generally by means of a wire, termed the furl-wire. Furling is in general accomplished

FIG. 4.—Vaneless Aeromotor.

manner as with the windmills shown in figures 2 and 3. In the windmill shown in figure 4 it is evident that any change in the relative positions of the steering wheel and the main windwheel will result in a change in the position of the latter relative to the wind. The frame carrying the steering wheel is pivotally mounted upon the frame which carries the main windwheel, and is held in its normal position with reference to it by the coiled spring H. In the ordinary running position the wind falls perpendicularly upon the side of the tail of the steering wheel, and when the pressure upon it exceeds the safe limit it overcomes the resistance of the spring and changes the position of the steering wheel so that the wind falls upon its face; this causes the steering wheel to act, which moves the main windwheel so that the wind falls obliquely upon it, thus reducing the ex-

posed sail area to such an extent as to prevent the action of the windmill. The reduction of the exposed sail area is in each case accomplished in the same manner as in the process of regulation, except that the force necessary to lift the weight or overcome the tension of the spring is applied through the furl-wire and transmitted by a suitable arrangement of levers or pulleys, instead of being supplied by the energy of the wind. Thus in the windmills shown in figures 2 and 3 a pull transmitted through the furl wire is applied to the tail in such manner as to bring it into a position parallel to the plane of the windwheel. In that of figure 4 the auxiliary wheel is turned through an angle of 90° by means of a pull on the furl-wire. It is to be observed that in each of the windmills heretofore mentioned the windwheel is adapted to rotate about an axis the normal

WINDMILL

position of which is parallel to the direction of the wind. A number of types of windmills have been devised in which the windwheel rotates about an axis, the normal position of which is in a plane perpendicular to the direction of the wind, but they have not attained a



FIG. 6.

sufficient degree of success to warrant considering them here. If A represents the plane area, in square feet, swept by the sails of the windwheel, V , the velocity of the wind in feet per second, and δ the weight in pounds of a cubic foot of the air, then the weight of air available per second for use by the windwheel is

$W = AV\delta$, and its energy is equal to $\frac{WV^2}{2g}$

g being a constant representing the acceleration due to gravity. The power in foot-pounds per second brought to the windwheel by this air is,

therefore, $L = \frac{WV^2}{2g} = \frac{V^3 A \delta}{2g}$. This expression

indicates that, other conditions remaining the same, the power of a windwheel varies directly as the cube of wind velocity, and directly as the area swept by the sails, both of which relations have been substantially verified by experiment. In the construction of windmills considerations of strength require that, in general, the linear dimensions of all of the parts shall bear the same proportional relation to each other, regardless of the size of the windwheel. Other conditions being equal, the weight of a windmill, therefore, varies directly as the cube of the diameter of its wheel, while its power varies directly as the square of the diameter of the wheel. Hence, in increasing the size of windmills, the weight, and the consequent cost of material, increase more rapidly than the capacity, and it is not, therefore, found practicable to increase their size beyond a certain degree. When a windmill is in operation the air currents which act upon it are so modified and broken up, by their contact with the sails and other members, as to render accurate mathematical treatment of the case impossible, in the present state of our knowledge. For this and other reasons, mathematical considerations of the case are chiefly of theoretic interest, and the development of the form of the windwheel has been due rather to experiment than to theory.

The most notable among the experiments which have been made upon windwheels are those made about the middle of the 18th century, upon windwheels of the European type, by John Smeaton, and those made in 1882 upon windwheels of the American type by Thomas O. Perry. In these experiments the following im-

portant facts were, among others, established: (1) The maximum power which may be obtained from a given windwheel varies directly as the cube of the wind velocity. (2) The sail speed of a windwheel, when developing its maximum power, varies directly as the wind velocity. (3) The load upon a windwheel, when developing its maximum power, varies directly as the square of the wind velocity. (4) The capacity of a windwheel varies directly as the square of its diameter. (5) The number of turns which a windwheel will make in a given time varies inversely as its diameter. (6) There is nothing gained by having the sail area of a windwheel greater than seven eighths of the area swept by the sails, and there is little gained by having it more than three fourths the latter area.

In order that the maximum power may be obtained from a windmill, in winds of varying velocity, the load must vary directly as the square of the wind velocity. In practice the load is seldom, if ever, made to vary in this manner. The most common form of installation is that in which a pumping windmill is directly connected to a single acting pump operating under a constant head. In such cases the average load during a complete cycle of the pump is practically constant regardless of the wind velocity. Moreover, the load varies, in general, from about zero during one stroke to a maximum at about the middle of the other stroke. This periodic variation of load is also a source of loss, especially when the windwheel is rotating slowly, and the amount of kinetic energy stored in it is small. In the case of power windmills the load depends upon the character of the work. Some grain-grinders

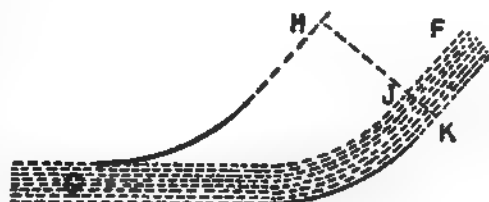


FIG. 7.

for use in connection with power windmills are constructed so that the grain is fed to them by centrifugal action, and in these instances the load upon the windmill is made to increase as the speed increases.

Mathematical Formulae.—In the following mathematical discussion all differences of pressure and density in and about the windwheel are neglected, and friction between the air currents and the various members of the wheel, eddies, and similar disturbing effects are also neglected. In order that the sails may derive power from the stream of air particles which acts upon them, the air particles must be deprived of a portion of their velocity by reason of their contact with the sails. The general manner in which this decrease of velocity of air particles occur is indicated in figure 5. The ideal conditions here indicated are assumed for convenience in determining the maximum attainable efficiency. Let V represent the initial velocity and direction of the wind, and V_1

WINDMILL

its direction and velocity as it leaves the wind-wheel. Both V and V_1 are assumed parallel to each other and to the axis of the wheel. Let A = area swept by the sails, and let δ = density of the air. Then the weight of air which acts upon the sails per unit of time is $AV_1\delta$, and the energy given up by the air is, $\frac{AV_1\delta}{2g} V^2 - \frac{AV_1\delta}{2g} V_1^2$. But the weight of air

brought to the wheel per unit of time is $AV\delta$, and its energy is, $\frac{AV\delta}{2g} V^2$. The efficiency of the wheel is, therefore,

$$E = \frac{\frac{AV_1\delta}{2g} V^2 - \frac{AV_1\delta}{2g} V_1^2}{\frac{AV\delta}{2g} V^2} = \frac{V_1 V^2 - V_1^3}{V^3}$$

$$E = \frac{V_1}{V} - \frac{V_1^3}{V^3}$$

To determine the relation between V and V_1 , corresponding to maximum efficiency, V may be considered constant and this equation then investigated for maxima and minima by means of

the calculus, $\frac{dE}{dV_1} = \frac{1}{V} - \frac{3V_1^2}{V^3}$

Putting $\frac{dE}{dV_1} = 0$,

$$\frac{1}{V} = \frac{3V_1^2}{V^3}$$

$$V^2 = 3V_1^2$$

$$V_1 = \sqrt{\frac{1}{3}} V$$

$$V_1 = .578 V$$

That is, for maximum efficiency, V_1 should be .578 of V . Substituting this value in the expression for efficiency, it becomes

$$E = \frac{.578 V^2 - (.578 V)^3}{V^2}$$

$= .578 - .191$, $E = .387$. That is, the maximum efficiency attainable is 38.7 per cent. Certain differences of pressure which exist in the region of the windwheel in operation tend to make possible higher efficiencies than this. Experiment indicates that efficiencies slightly in excess of 38.7 per cent may actually be realized.

For perfect action between a moving vane and a stream of fluid particles, the direction of the stream relative to the vane must be parallel to the surface of the vane throughout the period of contact, and the velocity of the stream relative to the vane must be constant throughout this period. This condition is indicated by figure 8. In the windwheel, a section of two sails of which is shown in figure 7, it is evident that, there being no change of relative velocity or of density, all of the air which approaches the sail at F cannot pass out at G , owing to the decrease in the width of the passage. Of the air which approaches at F , only

that part which passes between points J and K is effective in doing work on the sail, while the remainder (that which passes between H and J) must pass around the wheel and does no work. In view of these facts, the theoretical efficiency of a given sail element may be determined by the following graphical construction: Let $B D$ (figure 8) represent the actual direction and velocity of the wind. Let $A D$ represent the actual direction and velocity of the sails' motion. Let ϕ be the angle made by the trailing edge of the sail with the plane of the wheel. Then $B A$ = velocity and direction of the stream of air relative to the sail at impingement, and $B'A'$ = velocity and direction of the stream relative to the sail at escape. $B'A'$ is equal in length to $B A$. Now draw $A'J$ parallel and equal in length to $A D$, and draw $B' J$. Then $B' J$ = actual direction and velocity of the stream of air at escape. Draw $B''K$ perpendicular to $B'A'$ produced. Then $B''K$ is the width

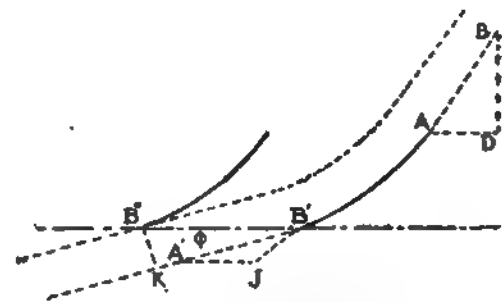


FIG. 8.

of the stream of air which acts upon the sail element $A B'$. For convenience the radial depth of the element, and therefore of the stream of air, is assumed to be unity. If δ is the density of the air, the weight of air which acts upon the element per unit of time is $B''K \times B A \times \delta$ ($B A$ being the velocity of flow and $B''K$ the area of the stream). The original velocity of this air was $B D$, and its final velocity $B' J$. Hence the work done by it is equal to,

$$\frac{B''K \times B A \times B D^2 \times \delta}{2g} - \frac{B''K \times B A \times B' J^2 \times \delta}{2g}$$

But the available energy is equal to

$$\frac{B''B' \times B D \times B D^2 \times \delta}{2g}$$

Hence the efficiency is,

$$E = \frac{\frac{B''K \times B A \times B D^2 \times \delta}{2g} - \frac{B''K \times B A \times B' J^2 \times \delta}{2g}}{\frac{B''B' \times B D \times B D^2 \times \delta}{2g}}$$

$$E = \frac{B''K \times B A \times B D^2 - B''K \times B A \times B' J^2}{B''B' \times B D^3}$$

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WINDOM—WINDSOR

Windom, win'dóm, **William**, American financier: b. Waterford, Ohio, 10 May 1847; d. New York 29 Jan. 1891. He was admitted to the bar in 1859, engaged in law practice at Mount Vernon, Ohio, and in 1852 was prosecuting attorney of Knox County, Ohio. He held this position for three years, when he removed to Minnesota. Sent to Congress from that State in 1859, he was re-elected to serve four successive terms, a period of 10 years, ending his career in the House in 1869. He was appointed to the United States Senate in 1870 to fill the unexpired term of Daniel S. Norton, deceased, and was also elected for the terms ending in 1878 and 1883. He resigned, however, in 1881, to accept the Treasury portfolio in President Garfield's cabinet, and on his retirement from the cabinet after that President's death returned to the Senate, where he served the remainder of his term. He was occupied with various financial interests in New York from 1883-9, when he was appointed secretary of the treasury in President Harrison's cabinet and occupied that position until his death. He was one of the earliest exponents of the gold standard, and was considered available as a Presidential candidate in three national conventions, those of 1880, 1884, and 1888.

Window, an open space reserved, as in a wall, for the admission of daylight into the interior. (See also **DOMESTIC WINDOW**.) The window generally is in a vertical wall. The opening may be filled with glazed sash or casement arranged to open and shut, as in the modern houses; or with glazed sash of wood, iron, or lead fixed firmly to the solid frame of the window, or with only a single panel here and there made to open, as in the case of churches both ancient and modern; or the space may have a slab of semi-transparent stone let into it through which much light may enter, as in some Oriental and ancient European buildings; or a slab of marble with holes cut in it may be inserted, or in place of this a continuous grating, as of bronze, both of which were frequent in classical Roman buildings; or, finally, the space may be left without permanent filling of any sort, shutters being used to close it when needed, as in many parts of Europe in the Middle Ages, and as common now in the tropics. Still a further modification of the last-named scheme is found in those tropical houses which have all the openings filled with *jalousies*, namely, shutters with slats (louver shutters), some of which may even be fixed fast, while others open on hinges. As the climate becomes too warm for the necessity of closing the windows at any time in the year, these devices tend to replace solid shutters and casements.

Architecturally the window is of the greatest importance to certain styles, and in others does not count at all. Thus in Grecian architecture there are no windows; and in Greco-Roman architecture the window has never been a controlling member because the great windows of the public halls are commonly the lunettes under the vaulting, simply pierced and filled with gratings instead of built up solid with masonry. The window of the ancient Roman dwelling, also, so far as we know it, was of less consequence because there were no openings of any great size in the outer walls, and the rooms opening inward upon the court or garden were

more or less without walls on that side, a large doorway and a square window above the bed-place needing nothing but a curtain or the like to screen them. Even in Byzantine and Syrian art the window, though beginning to be emphasized by a stone trimming or casing, is not that which the style depends upon. But in the mediæval styles of northern and western Europe the window is the chief feature after the roofs with their fixed slope and their height above the walls. The earliest Romanesque had windows, small indeed, but with jambs richly molded in the thickness of the heavy walls; and the later style takes on some of the variety and brilliancy of the Gothic work. The Gothic window in a church is the opening up of the whole wall space between buttress and buttress and below the vault; and this space tends to be filled with elaborate tracery. Even apart from the tracery, the moldings of the jamb—often with colonnettes produced by fitting a round molding with capital and base, and with sculpture added to the sill-course—may be very decorative. In dwelling-houses tracery was rare, but the window, if large, was closed with a pointed arch and the head filled with a slab of stone pierced with a decorative opening and supported by colonnettes, or in some other way architecturally treated. The very numerous windows with square heads, that is, with lintels instead of arches, are made ornamental by moldings, sometimes very rich and elaborate, and by the free use of colonnettes to carry the lintels. In the neo-classic style a curiously regulated and ordered system of arranging the windows became customary in the early days of the Renaissance, and was completely developed in the 16th century in Italy, and 50 years later in the north. Under the name of fenestration this ordering of the windows has become a most important part of designing, especially in the street fronts of city buildings. The window-cavings may even be ornamental in themselves, though with an ornamentation not strictly belonging to them, but borrowed, as it were, from other parts of the structure: thus, small pediments are used to crown the window openings, and even columns are used, one on either side of the window opening, to support these pediments. But the main thing is still the arrangement of the windows in the wall and the proportioning of these openings and the solid wall between them.

RUSSELL STURGEON.

Window Glass. See GLASS.

Window Tax, a tax formerly imposed in Great Britain on all windows in houses (latterly above six in number). It was abolished in 1851, a tax on houses above a certain rental being substituted.

Window Tax War. See UNITED STATES, WARS IN THE.

Windsor, win'zor, Canada, a seaport town, capital of Hants County, Nova Scotia, on an inlet of Minas Bay, and on the Windsor & Annapolis Railway, 45 miles northwest of Halifax. Its chief institution is King's College (q.v.), or Windsor University, founded in 1788. It is a busy shipping port, is electrically lighted, and has a considerable export trade in the gypsum and limestone of the region.

Windsor, Canada, the largest town in Essex County, situated on the banks of the Detroit

WINDSOR — WINDTHORST

River, opposite the city of Detroit. Five railways enter the city, including the Grand Trunk, Canadian Pacific, Michigan Central, Wabash, and the Ontario division of the Pere Marquette. The location makes Windsor one of the desirable residential cities of the continent. It has 10 churches, 10 schools, a Collegiate institute and Saint Mary's Academy. The chief manufactures are the Canadian Salt Co., paint and varnish works, sash, door and planing factories, boiler works and machine shops, with various minor industries. It has several miles of paved streets and an adequate sewerage system. There is a rapid increase in population which is about 17,000.

Windsor, Conn., town in Hartford County; on the Connecticut and Farmington rivers, and on the New York, New Haven & Hartford Railroad; six miles north of Hartford. It is in an agricultural section in which the chief products are vegetables, fruit, and tobacco. The principal manufactures are worsted goods, paper, electrical motors, knit goods, tobacco products, and dairy products. The educational institutions are the Hayden Hall-Home School for Girls, a town high school, kindergartens, 10 public schools, and a public library.

The first settlement was made in 1633 by William Holmes and companions from Plymouth. They established here a trading post. In 1635 Roger Ludlow and a colony from Dorchester, Mass., settled near the trading post and called the place Dorchester. In 1637 the name was changed to Windsor. In 1639 Windsor united with Hartford, and Wethersfield, under "Fundamental Orders," to form the commonwealth of Connecticut. Pop. (1900) 3,614; (1910) 4,178. Consult: Stiles, 'Ancient Windsor'; 'Memorial History of Hartford County.'

Windsor Locks, Conn., town in Hartford County; on the Connecticut River, and on the New York, New Haven & Hartford Railroad; about 12 miles north of Hartford. It was a part of the town of Windsor until 1854, when it was set off and incorporated. It is a manufacturing town; extensive water-power is obtained from the Connecticut by means of a canal. The chief industrial establishments are paper mills, cotton yarn and thread factories, a foundry, machine shops, steel works, and silk factories. Other manufactures are furniture, trucks, school globes, and carpet-loom chains. In 1900 (government census) Windsor Locks had 37 manufacturing establishments, capitalized for \$2,117,150; the annual output of which was valued at \$1,311,268. The principal public buildings are Memorial Hall, presented by Charles E. Chaffee to J. H. Converse Post 67, G. A. R.; four churches, and the public and parish schools. It has one bank. Pop. (1890) 2,758; (1900) 2,997; (1910) 3,715.

Windsor, or New Windsor, England, a town in Berkshire, on the Thames, 21 miles by rail west of London. Windsor and Eton (q.v.) practically form one town, which is chiefly interesting on account of the castle and park, a favorite residence of the English sovereigns since the time of William the Conqueror. The original royal palace, where the Saxon kings lived before the Conquest, was at Old Windsor, about two miles distant, but the present site

was chosen and the castle built by William; later extensions were added by Henry I. and Henry II., but during the reign of Edward III. it was torn down and rebuilt by William of Wykeham, Bishop of Winchester. The new castle received various additions by the orders of succeeding monarchs until the time of Queen Victoria, who restored and sumptuously decorated Albert chapel as a memorial to the Prince Consort, Albert. The buildings comprise upper, lower, and middle wards, extending along the crest of an eminence rising 42 feet above the river, and covering 12 acres in the Little or Home Park, which is connected with the Great Park and adjoining Windsor Forest, the whole occupying an area of 13,000 acres, 56 miles in circumference. The lower ward on the west contains Saint George's chapel, the Albert chapel, the houses of the military knights, cloisters, etc.; the Middle Ward, dominated by the Round Tower, rising to a height of 80 feet, built by Edward III. to accommodate the round table of the Knights of the Order of the Garter, containing the rooms which were up to 1666 used as a prison; the Upper Ward on the east, comprised of the sovereign's private apartments, the library and the long corridor. Saint George's Hall, the Waterloo Chamber, the Throne Room, and the old Ball Room, comprising the state apartments in the Upper Ward, have valuable collections of paintings, statuary, etc. Under Saint George's chapel is the burial vault of several English rulers and members of the royal family. The royal palace and the mausoleum of Frogmore, Cumberland Lodge, and Virginia Water are in the park. The town hall of Windsor was built by Christopher Wren in 1658.

Windthorst, Ludwig, leader of the Catholic or Center party in the German Reichstag from 1874 to his death: b. at Kaldenhof, near Osnabrück in Hanover, 17 Nov. 1812; d. Berlin 14 March 1891. He received his early education at the Caroline Gymnasium in Osnabrück and studied law at Göttingen and Heidelberg. He began the practice of law at Osnabrück. He occupied various official positions in connection with German Courts of Law and his talents and impartial character were widely recognized. Politically he clung to the opinion that there should be a union of the German states including Austria. He emphasized the necessity for the preservation of the independence of the various petty German governments and of absolute freedom of religion and education. In 1851, he was elected president of the second chamber of the Legislature of Hanover, and in 1853 became the Minister of Justice in the cabinet of George V. He held this same portfolio ten years later. In this position, his treatment of vexed questions between Catholics and Protestants called forth praise from both parties. When the reigning house of Hanover fell as the result of the war of 1866, he was sadly disappointed, but fitted himself at once into the new order of things in the fatherland, by accepting election for the town of Meppen, to the Prussian Lower House and to the Reichstag of the North German Confederation. Here he soon came to occupy a prominent place as a valuable assistant of the leader of the Catholic party, Mallinckrodt. At Mallinckrodt's death, 1874, Windthorst was selected to replace him.

WINDWARD ISLANDS—WINE

For nearly twenty years, he remained a successful leader of the party, which under his influence gradually came to have the balance of power in the Reichstag. While he was a devoted Catholic, he was an intense lover of his country, believed thoroughly in the maintenance of the German army in order to assure peace, and the last speech that he ever made, scarcely a month before his death, was in favor of a liberal programme of development for the navy. Once when Vatican influence seemed to be used to urge a political measure, in which the German government was very much interested, he came out distinctly in opposition. Just before the declaration of the infallibility of the Pope, he joined with those who thought the moment inopportune but he was always devoted to the Holy See. He was the model of a successful party leader; an expert in the management of men; an excellent judge of character and one of the best Parliamentary debaters of the 19th century. In spite of his years of occupation of an influential political position, he died quite poor. When the Catholics of Germany wished to recognize his great services to their cause by the subscription of a large sum of money, he diverted it to the foundation of a church in honor of the blessed Virgin to be erected in Hanover. Few statesmen have been more bitterly maligned than was Windthorst at the beginning of his career. After his death, political foes joined with friends in recognizing his talents, his uprightness of character and the absolute purity of his motives, besides his lofty patriotism. His great merit is to have succeeded in preventing Bismarck from making the Church merely a department of state in Germany. The Catholic party agreed that it was to his talents as a leader that they owed most of their success in the struggle with the German Chancellor. Consult: Menzenbach, 'Windthorst' (Treves 1892); Knapp, 'Windthorst' (Männer der Zeit Series) Leipzig 1898.

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Windward (wind'ward) Islands, a group of the West Indies forming the southern part of the Lesser Antilles, including Saint Lucia, Saint Vincent, Grenada, and the Grenadines. They are of volcanic origin, the larger islands are mountainous; the lower levels being generally fertile and producing sugar, cocon, and spices; logwood and other timber are also obtained. They belong to Great Britain; the governor resides at Saint George's, Grenada. The islands have no common legislature, laws, or tariff; but there is a common court of appeal, and they unite for other purposes. See also the names of the individual islands of the group.

Wine and Wine-making. It may have been design, but it was probably an accident, that first led man to crush or to press grapes in order to obtain a palatable and stimulating beverage. As long as the juice is confined within the grape, it becomes sweeter and sweeter as the fruit grows riper and riper. But when the skin is broken by crushing or pressing, and when the juice is allowed to remain a short time exposed to warmth and air, it changes its character and develops new and unsuspected qualities or properties.

The series of changes from the fresh grape juice to an alcoholic drink may be best illustrated by describing the process briefly as follows:

When the juice, or "must," is exposed to temperatures ranging from 50° F. to 65° F. the liquid very soon begins to become turbid, small bubbles collect on the surface and the grape skins, stems, and other solid particles, form a dense cover or "cap" on the top. Carbonic gas, which is developed in increasing quantities, escapes with a loud bubbling sound, and, as the temperature rises, the juice appears as though it were really boiling. After a few days, and sometimes after a few hours, the ebullition subsides and gradually the crust and undissolved substances fall to the bottom. Meanwhile, the must has lost its sweetish taste, and its original character and chemical composition; among other things, it has acquired a richer, deeper color, a vinous flavor and odor, and a certain amount of alcohol.

This interesting natural process, which leads to the formation of alcohol, was described by the term "fermentation," from the Latin *fermentum*, the root word being *fervere*, to boil. This feature of the phenomena, whereby the evolution of the gas makes the liquid appear to boil, evidently struck the early wine-makers and natural philosophers as most important. It was a long time before the true nature of the process of vinous or alcoholic fermentation was clearly perceived and properly understood.

Early in the last century (from 1810-25) chemical analyses by Gay-Lussac, Thénard, and De Saussure fixed accurately the composition of sugar in the must and of alcohol in the wine. In 1835 Cagniard de Latour found that the globules were definite organisms, capable of reproducing themselves by budding, and thus apparently belonging to the vegetable kingdom. He came to the conclusion that, in the course of vegetation, these globules, or "ferments," disengaged carbonic acid gas and converted the liquid into an alcoholic liquor.

This discovery, which is at the basis of the modern principles and practices of wine-making, was confirmed two years later (1837) by Schwann at Jena and Kützing at Berlin. The newly-found organism was regarded by some as belonging to the fungi and by others to the algae. Meyen showed that the organism was a fungus, and established a new genus for it under the name of *Saccharomyces*. In other words, the agents of alcoholic fermentation are called "yeasts" and belong to the order *Saccharomyces*.

Recent Researches in Alcoholic Fermentation.—The work of the great chemist Pasteur threw a flood of light upon the whole process of fermentation. His investigations extending over a series of years were first summed up in his 'Studies on Wine' (*Études sur le Vin*), published in 1872, and further in his book, 'Studies on Beer' (*Études sur la Bière*), published in 1876.

To Pasteur belongs the honor of establishing beyond question that fermentations were the work of infinitely small organisms called "microbes." He classified and described many of these micro-organisms. He divided them into two classes: aerobic, those which can not live without the presence of free air; and anaerobic,

WINE AND WINE-MAKING

those which can exist in the absence of air. The former *saccharomyces* are found at or near the top of the liquid during fermentation; the latter are at work lower down in the body of the liquid.

The microscopical examination of the agents of alcoholic fermentation has revealed quite a number of different forms and varieties. Some 25 or 30 types of the genus *Saccharomyces* have been identified.

The question may very naturally be asked: Where do these yeast organisms come from? Pasteur showed very clearly that the ripe grape is covered with a mass of micro-organisms. These microbes collect on the fruit and stems, and constitute the "bloom" of the grape. Just why they should fix themselves on the fruit, and remain, as it were, in readiness to be transformed from their dormant state to one of great activity when carried into the juice of the fruit is a mystery. At the same time a great number of other and less desirable yeast cells (bacteria) become submerged in the grape juice, or must, and these foreign yeasts are the ones that give the wine-maker trouble, and lead to many diseases of wine.

Cultivated and Selected Yeasts in Wine-making.—A brilliant Danish chemist, Emil Chr. Hansen, took up the study of alcoholic fermentations and "disease ferments," where Pasteur left off. He brought out many new facts with regard to the many different races or species of *Saccharomyces*, which gave very different characters to beers. Hansen found that it was practical to separate and cultivate the better species or races of brewer's yeasts. With great skill and much care he was able to select two varieties of "low" yeast and then he worked out a method for the pure cultivation of yeast.

The use of pure cultivated yeasts has been attended with good results in wine-making. Musts have been prepared with pure yeasts and have been compared with musts fermented at the same time without such yeast. In most cases the pure-yeast wine has been regarded as superior to the other. One practical value of employing pure cultivated yeasts in wine-making is that under proper conditions they will control the progress of fermentation, and thus overcome the influence of the undesirable organisms in the must, such as mold-fungi, wild yeasts, bacteria, and mycoderma. By using selected yeasts from celebrated vintages, wine-makers have been able to obtain finer flavors and bouquets, all of which adds to the quality and value of their product.

Fermentation and Enzymes.—In order to grasp and properly understand the various problems connected with the phenomena of fermentation, it is necessary to say something about its relation to enzymes. The term "enzyme" is now used to indicate the *soluble* ferments secreted or formed in the yeast cell. Pasteur's theory makes fermentation a vital act, depending on a living organism. Recent discoveries show fermentation to be also a chemical act. A few years ago the German chemist, Büchner, proved that alcoholic fermentation can be carried out by a soluble ferment which is extracted from the yeast cell. So that we can have the phenomena of fermentation without the growth and multiplication of yeast cells. To this enzyme in the yeast extract Büchner has given the name *zymase*.

The effect of these recent discoveries in fermentation may be very great and far-reaching, and just what practical form they will take in wine-making and other industries it is impossible to predict.

The Vintage.—The word "vintage" has come to have quite a wide signification. It may be used to include three distinct steps: (1) the gathering of the grapes; (2) the processes of fermentation, and (3) the general cellar operations connected with the care and handling of the new wine.

The practices of wine-makers are different in different countries, and in different localities of the same country. This is owing to difference in soils, climates, conditions, varieties of grapes used, and in the kinds or types of wines to be produced. And yet, the main principles which give the best results in practice in one country are practically the same in any other country where wine is made.

It should be borne in mind, however, that wine-making is partly an art and partly a science. As such, it can not be learned and mastered by reading, or from books. The best we can here do is to describe briefly some of the more important details connected with the manufacture of wines.

Gathering of the Grapes.—The general rule is that grapes should not be gathered till they have reached a state of complete maturity. This condition is shown by certain well-known indications, such as the brownish color of the stem, the softening of the berry, and its easy separation from the stem, the skin is translucent, the juice becomes sweet, thick, and somewhat sticky.

The wine-maker determines the best time for gathering the grapes by using various instruments, known as a must-scale, mustimeter, glucometer, etc. They are employed for the purpose of finding out the saccharine richness or strength of the grape juice, or must. To judge of the sugar content of the grapes a few bunches representing the average condition are first gathered, the juice is expressed and strained through a cloth, collected in a suitable receptacle, and then the must-scale is carefully dropped into it. The quality of the must will be indicated on the stem of the scale. The grapes should be tested from day to day until the density, as shown on the scale, remains stationary, when it is time, as a rule, to gather the crop.

The oldest scale, that of Baumé, was devised to indicate the specific gravity of liquids, or their weight, as compared with that of water. Later scales give the density of the liquid direct, the density of water being indicated by 1. The glucometer invented by Dr. Guyot is very convenient and is used by the French wine-makers. This scale indicates at once, the degree Baumé, the quantity of sugar in the must per hectolitre, and the amount of alcohol that will result from the fermentation of the must per hectolitre. The Salleron mustimeter is another very useful instrument, highly regarded by French wine-makers. The instruments mostly used in this country are Oechsle's must-scale and Balling's saccharometer. All the different must scales are also used during fermentation to determine when the sugar contained in the must has been entirely transformed into alcohol.

Composition of the Must.—A very good idea of the qualities of a good, average must may be

WINE AND WINE-MAKING

Three distinct phases of fermentation will be observed: (1) The first day or two when the ferments are multiplying; (2) the tumultuous fermentation, accompanied by a violent bubbling of the liquid and a rise in temperature, and (3) the active but relatively quiet fermentation.

As a general rule, the more rapid the fermentation the better is the result. In the Southern States and in southern California the process may be completed in one, or two days. In the northern or temperate climates the time will run from seven to ten days.

The Influence of Temperature.—As we have already indicated, temperature exerts a controlling influence on fermentation. The yeast works best in temperatures ranging from 59° F. to 75° F. Below 59° its action is very feeble and slow; above 75° fermentation becomes retarded and even stops if the temperature passes much above 90°.

Thus, wine-making both in very hot and in very cool climates often presents many difficulties to be overcome. The must frequently becomes what is called "stuck"—that is, fermentation ceases before all the sugar is transformed into alcohol.

If the trouble comes from too low a temperature, the remedies are: (1) To raise the temperature by heating part of the must; (2) to heat up the fermenting room; (3) to increase the activity of the yeast by adding sediment from vats already through fermentation, and (4) to stir up the pomace so as to bring the germs in contact with the air, as the yeast is always "greedy for oxygen."

When the temperature of the must in the vats rises too high, it is necessary to lower the temperature in one way or another. Several methods are employed for cooling the must. Among these we may mention the use of shallow vats, racking off, and refrigerating systems. The difficulties of wine-making in our Southern States and in Southern California can be overcome only by the adoption of a suitable system for cooling musts.

The success of the wine-maker will always depend on his success in being able to control the progress of fermentation. Therefore, he should be able to control the temperature, which during fermentation has a most important influence (1) on the yield in alcohol, (2) on the qualities of wine, and (3) on the keeping quality of wines.

Drawing off the Wine.—Active fermentation can be recognized as being over, by the falling of the temperature, the settling down of the solid mass, or marc, by the clearing of the liquid, and the vinous taste and smell. The new wine will show from 0° to 2° by Balling's saccharometer, nearly all the sugar having been transformed into alcohol. It is either run into a large tub and emptied into casks, or it is pumped into casks. The drawing off of the new wine leaves in the vat the "marc," which contains a considerable quantity of wine. The marc when pressed furnishes what is known as "press-wine"; this represents usually about one fourth of the product, and the vat-wine three fourths.

Wine Presses and Press Wines.—It is not necessary to enter into a detailed description of the different forms of wine presses. They are worked by a screw or by hydraulic pressure to be operated either by hand or steam power. Where grapes are handled on a large scale, as

in some sections of France and California, continuous presses of recent invention are used. They are composed of two or more cylinders, worked as crushers, and after passing through these cylinders the grapes are carried by a screw, which forces them in a perforated horizontal cylinder, terminating in an orifice through which the marc in a compact cake is expelled. Even the best presses are not perfect as far as the yield or quality of the wine is concerned. Recent experiments show that the marc can be exhausted without presses.

The first run from the press is of course the best. It is often mixed with the vat wine. The second, third and fourth lots are inferior, and seldom mixed with the other wine; the last run is used for making vinegar or brandy.

Utilization of the By-Products.—From the husks and lees are obtained the following products: Second wines, "Piquettes," and by distillation, brandies and tartar. The second wines are produced by adding water to half the amount of the wine already drawn off, sufficient sugar to give from 6 to 7 per cent of alcohol, and tartaric and tannin when acidity is needed. The piquettes are sour wines obtained by adding pure water to the marc, before or after pressing; the cask is filled and closed. In course of time a "wine" having from 3 to 4 per cent of alcohol is produced, but it will not keep long. This is the cheap but healthful drink so largely consumed by the peasants and working people in France.

Brandies.—They are obtained either by distilling the marc direct, or by the distillation of a piquette wash. The best kind of brandy of the Cognac type is produced by distillation of a sound, clean wine. This process of distillation requires improved stills and special treatment. The "wash" for brandy spirits is obtained by running water into a tank filled with the marc, or pomace; the overflow is allowed to run into a second tank containing pomace, and the overflow from this tank passes into a third tank filled with pomace. It is seldom profitable to distil the wash unless it contains from 5 to 7 per cent alcohol.

Tartar.—This is extract from the lees, or deposited as a crust in the vats. It is obtained by causing a mixture of the marc and water to boil slowly for an hour or so, when the boiling liquid is drawn off and cooled the tartar crystallizes out. From the crude product is manufactured "cream of tartar," and tartaric acid.

Manufacture of White Wine.—The making of white wine differs from that of red wine principally in the matter of not having fermentation of the must take place in contact with the skin and solid parts of the grape. Two processes are to be taken into account: (1) The making of white wine from white grapes, and (2) the making of white wine from red or dark-colored grapes. The first-named process is of course the easiest one. Briefly stated, it consists in crushing the grapes, draining them, putting the drained marc in the press, and then leaving the juice from both of the operations to ferment. The main thing is to get the liquid free from impurities, as white wine should be perfectly clear. The usual method is to allow the must to settle and the suspended impurities to be deposited. The liquid must therefore be kept perfectly still for the required time; in other words, it is kept from starting into fer-

WINE AND WINE-MAKING

mentation. This is accomplished by the process called "sulphuring." The effect of applying sulphurous acid to the must is to paralyze the action of the ferments or yeasts.

After the must has become clear, it is separated from the deposit and run into the vat to undergo fermentation. During this process the must should be aerated as much as possible in order to drive off all odor of the sulphurous acid, as well as to encourage the activity of the yeast. The fermentation starts slowly and is always less vigorous than in case of red wines. When the fermentation is over, the white wine should be racked and put in casks which have been lightly sulphured and allowed to remain until perfectly cleared.

The manufacture of white wine from red or dark-colored grapes is attended with much more difficulty and labor than in the process of using white grapes. Without going into details, the main points to be observed are: (1) To avoid breaking the skins of the grapes, and thus start fermentation before crushing; (2) to proceed rapidly with the work of crushing and pressing; (3) to crush the grapes so as not to free the coloring matter in the skins; (4) to suppress all traces of coloring matter in the must, and separate the suspended impurities by the method above described. It is the opinion of expert wine-makers that in order to obtain the best results, white wine should be made from both white and red grapes.

Sweet Wines.—The familiar French term for sweet wines is *vins de liqueur*. These wines are the result of manipulation; that is to say, sweet wines are not obtained by the plain and simple process of fermentation of fresh grapes, but they have more or less alcohol added, and in some cases sugar is added. The best-known types of sweet wines are: Port, Sherry, Tokay, Madeira, Malaga, etc.

Port Wine.—Wines of this type are produced by fermenting the must down to 6 to 8 deg. of sugar, and then from 4 to 7 per cent alcohol is added to arrest further fermentation. This will give a wine having a strength of from 14 to 15 deg. alcohol. In the following spring the wine is racked, and from 2 to 3 deg. more of alcohol added. Thus, in the course of a year or so Port wine is gradually brought up, or "fortified," to 20 and 22 per cent. alcohol. Contributing to the final result are the methods of "blending," whereby color, body, flavor, bouquet, etc., are obtained.

Sherry Wine.—Our word "Sherry" is derived from the Spanish name Xeres, and this type of wine was originally produced and shipped from the town of Xeres. It is made from several varieties of white grapes grown in the province of Andalusia. The usual Spanish custom is to sprinkle each pressing of grapes with a certain amount (two or three handfuls) of gypsum. This operation, called plastering, is regarded as favoring fermentation. The must is fermented down to about 8 or 10 deg. sugar, and then alcohol is added, bringing the wine up to 16 or 18 deg. alcohol.

One feature of the manufacture of sherry wine in Spain is the system of *Soleras*. The word describes fine old mother wine, and the system consists in blending wines of different ages or years. Thus, the casks of sherry wine are arranged in groups, piled in tiers, and the groups graded according to quality. When wine

for blending or shipment is drawn from the group of casks constituting the oldest solera, they are refilled with wine from the casks of the next younger solera, and these again from the next, and so on down to the last group.

Another feature in the production of sherry is baking the wine by natural or artificial heat. The casks containing the wine are ranged in a building with the roof and exposed side covered with glass. The temperature in this sherry house during the day runs as high as 140° F. and is maintained at night by fires. Several of the large producers of sherry in California attain the same end by baking the wine in a specially-built chamber or room, which is heated by steam or hot air.

Champagne and Sparkling Wines.—The word "Champagne" was originally very properly applied to wines, whether still or sparkling, made in the champagne district of France. It now has a wider and more special meaning. By custom and popular usage champagne is the name given to a type of sparkling wine produced by a process of fermentation in the bottle. Thus, we have not only French champagne, but German champagne, Italian champagne, American champagne, etc. Sparkling wines are produced in most wine-making districts; some of the best known are, Sparkling Saumur, Sparkling Burgundy, Sparkling Beaujolais, in France; Sparkling Moselle in Germany; Sparkling Catawba, in the United States, etc. There are also "imitation champagnes." These are still wines which have been made sparkling by having carbonic acid gas forced into them, somewhat after the same fashion as soda water is produced.

The manufacture and manipulation of champagne requires considerable skill and knowledge. Some of the steps in the process may be described:

After the wine has gone through its first fermentation, it is racked off into casks, and a blend of the juices of different grapes is made. Then the wine is bottled and put in a warm place in order to start a second fermentation. At the proper time the bottles are stored in cool vaults, where the temperature is 50° F. or lower the year round, and where fermentation proceeds very slowly. It is important to keep the vaults at an even temperature, in order to prevent serious loss from breakage which a sudden rise in temperature would cause.

At first the bottles are stacked in horizontal layers, and as the wine begins to mature the bottles are placed in A-shaped racks. The bottles are gradually worked neck downward, in order to bring the sediment, which forms during the slow fermentation, down upon the cork. This is accomplished by the workmen giving each bottle a quick shake once or twice a day during a period of four to six weeks.

When the wine is taken to the finishing room, the sediment down on the cork is "disgorged"—that is, the workman loosens the cork and the lively pressure of the gas in the bottle forces out the sediment, leaving the body of the wine perfectly clear. Champagne in this state is "brut"—almost absolutely "dry." To please the taste and palate of consumers, the wine is sweetened by adding a little liqueur, or "dosage" as the French call it, composed of rock candy syrup dissolved in old wine or brandy. The final operations comprise putting in a fine cork in the bottle, wiring and capping it, pasting on

WINE AND WINE-MAKING

the label and casing the bottles in boxes for shipment. It has been figured that a bottle of champagne from start to finish is handled about 200 times.

Handling and Taking Care of Wine.—It is always necessary to keep casks or barrels of wine in a well-ventilated, cool place. When wine is drawn off, and when there is loss from evaporation, the barrel should be filled up.

New wine soon begins to clear itself by the deposit of solid matters held in suspension. The thick deposit which forms at the bottom of the cask is called the lees. In order to prevent the lees from mixing with the liquid, wines are "racked" or drawn off several times a year. The sudden changes of temperature in the spring and autumn disturb wines, and so it is the practice to rack them at these periods. When racking it is not desirable to let the wine come in contact with the air. In order to obtain perfectly clear wines it is usually necessary to filter or clarify them.

The following method for clearing red wines, such as claret, etc., may be recommended: Take the whites of five fresh eggs for every 50 gallons of wine, beat them up into a foam. Then put this foam into a gallon of the wine to be fined, and after beating it again pour the mixture into the barrel.

Then take a stick and stir the whole barrel of wine until the foam appears at the bung-hole, which should be in about ten minutes. Leave the bung off over night. The next day fill up the barrel with same kind of wine, and drive in the bung. The wine should be bright in from 10 to 15 days; if not, then fill up, and, at the end of another week it should be.

For clearing white wines, such as Riesling, Hock, Sauterne, etc., take one wineglassful of dissolved isinglass for every 50 gallons of wine. Beat this into a foam with a gallon of the wine to be fined. Pour it back into the cask, and follow the directions above given for red wines. Usually the white wines take a little longer time to clarify than do clarets.

Some Diseases of Wine.—Wines are subject to many diseases. They often become "sick." Then they need "nursing" and doctoring.

Acid Wines.—They are due to the change of alcohol into acetic acid under the action of the air and heat. When wine has become slightly sour, rack it into a cask strongly sulphured, and clear it with six whites of egg to about 250 bottles. Some try to correct acid wine by mixing it with good, sound new wines, or with fresh lees, but the cure is only temporary. Wines so corrected only have their acidity disguised, and must be used soon.

Greasy Wines.—When wines turn greasy they cloud and rope like oil. White wines are more subject to this disease than red. Wines weak in alcohol and tannin are subject to the disease. Therefore, the addition of brandy spirits and tannic acid is recommended. Some also use a half a pound of alum for a cask, which should be stirred thoroughly and rack off several days afterward.

Flat or Cloudy Wines.—This is found in wines poor in alcohol and having an excess of albuminous material. The trouble is cured by transferring the wine to a freshly sulphured cask and adding alcohol. The wine should be fined, and after a few days from 50 to 60 grains of tartaric acid per 50 gallons should be added.

Bitterness.—This is, or was, one trouble with French Burgundy wines. The disease is not so common in this country. The defect may be corrected at the start by putting the wine in sulphured cask, and adding sufficient alcohol, tannic acid, and tartaric acid.

Classification of Wines.—The following is a list of well-known types of wines, arranged according to the countries where produced:

1. FRENCH WINES.—Claret, Graves, Sauternes, Barzac, Burgundy, Hermitage, Roussillon, Chablis, Frontignac (Muscat), Champagne, Saumur, etc.
2. GERMAN WINES.—Riesling. The terms Rhine, Moselle, and Pfalz are usually applied to the growths in those districts. The word Hock is also applied to certain Rhine wines.
3. AUSTRIAN WINES.—Vidua, Goldsch, Hungarian Wines.—Tokay, Ausbruch, etc.
4. ITALIAN WINES.—Barolo, Barbera, Nebbiolo, Valtellina, Asti, Chianti, Lacryma Christi, Falerio, Capri, Marsala, Muscat of Syracuse, etc.
5. SPANISH WINES.—Sherry, Malaga, Val de Penas, Vinos Finos (Spanish Reds).
6. PORTUGUESE WINES.—Port, Lisbon, Colares, Corcovello.
7. MADEIRA AND CANARY ISLAND WINES.—Madeira, Malvasia, Canary (each), Malvasia.
8. GREEK AND IONIAN WINES.—Hymettus, Nemea, Kephissus, Corinth, Patras, Santoria, etc.
9. SWISS WINES.—Muschel, Gringet, and Monvins.
10. TURKISH WINES.—Candia (Island of Crete), Cyprus, Mt. Lebanon, etc.
11. RUSSIAN WINES.—Crimean, Kakhobian (Caucasus), Donk, and Kravich Champagne.
12. AUSTRALIAN WINES.—Australian Burgundy, Hermitage, Sauterne, Port, etc.
13. CAPE OF GOOD HOPE WINES.—Cape Madeira, Constantia.
14. PERSIAN WINES.—Shiraz.
15. WINES OF THE UNITED STATES.—(a) From native varieties of grapes grown east of the Rocky Mountains: Seppernong (in the Southern States), Catawba, Delaware, Norton's Virginia and Iowa, Claret, Concord, Iona, Champagne, etc. (b) European or foreign varieties of grapes are grown in California; therefore we have the following "types": Claret, Burgundy, Zinfandel, Riesling, Sauterne, Port, Sherry, etc.

For convenience we may group some of the leading wines as to color and taste, although it should be remembered that many of them are made in color both red and white; in taste sweet and dry.

Red Dry Wines	Catawba
Claret	Delaware, etc.
Burgundy	Red Sweet Wines
Hermitage	Port
Barolo	Tokay
Valtellina	Constantia
Chianti	Roussillon
Zinfandel	Tarragona (Port)
Norton's Va.	White Sweet Wines
Ives Seedling	Sauternes
Cynthiana, etc.	Sherry
White Dry Wines	Muscatel
Graves	Angelica
Sauternes	Lacryma Christi
Chablis	Marsala
Moutschet	Malaga
Rhine, or	Catawba
Riesling	Delaware
Moselle	Seppernong, etc.

Alcoholic Strength, etc., of Wines.—The figures in the following table have been taken from the various analyses by competent authorities:

	Specific gravity	Per cent of alcoholic weight on volume
Claret	995.0	9.6
Rhine	992.8	10.2
Sauterne	993.7	11.7
Burgundy	991.3	10.3
Champagne	1010.9	10.4
Sherry (natural)	985.9	16.0
Sherry (fortified) .....	.....	.....
Marsala (natural)	995.9	16.0
Marsala (fortified) .....	.....	.....
Port (natural)	999.2	14.5
Port (fortified) .....	.....	21.5
(Specific gravity water = 1000)		

WINE AND WINE-MAKING

During the past 20 years many analyses of European wines have been made, and the data thus obtained have been used for the purpose of arriving at a standard for judging wines. In this way it is possible to determine the purity and quality of any type of wine. The limits of composition and the ratios which have been adopted in European countries for applying analytical results in judging the purity and quality of wines, together with a number of analyses of American wines, have been compiled by W. D. Bigelow of U. S. Department of Agriculture. (See Bulletin No. 59 on "The Composition of American Wines," 1900.)

The standards which have been adopted for European wines are met in all particulars by the best American wines. This is shown by the chemical analyses of American wines receiving awards at the Paris Exposition of 1900. (See Bulletin No. 72, Bureau of Chemistry, U. S. Department of Agriculture, 1903.) According to this report, "the percentage of alcohol in the samples of dry wines conforms to the standards that have been adopted for European wines. The ratio of alcohol to extract and the sum of the alcohol expressed in grams per litre and the total acidity expressed as grams per 100 cc. conform to the ratios adopted in France for wines to which neither alcohol nor water has been added." It is also stated that, the percentage of acids in the samples examined conforms to the standards of the wine-producing countries. These and other facts go to prove (what is not generally known or held) that our American wines challenge favorable comparison with European wines. It is only a few foreign types of special excellence which surpass those which we produce. In all respects—in purity, cleanness, color, taste, bouquet, etc.—the average American wines are better than the average wines drunk in Europe.

The Wine Production of the World.—The following figures in most cases from official reports show the vintage of the leading wine-making countries of the world for years 1900 and 1903:

COUNTRY	1900 Gallons	1903 Gallons
France	1,485,719,000	1,710,000,000
Italy	583,000,000	856,520,000
Spain	517,000,000	428,000,000
Portugal	138,600,000	108,320,000
Austria	70,400,000	192,800,000
Rumania	91,300,000	52,140,000
Chile	68,200,000	74,200,000
Russia	52,800,000	70,620,000
Bulgaria	74,800,000	39,100,000
Germany	79,208,000	79,600,000
Argentina	40,708,000	34,350,000
Turkey	48,400,000	34,360,000
Greece	19,800,000	..
Switzerland	34,320,000	22,190,000
United States	31,400,000	34,000,000
Serbia	26,400,000	6,605,000

Thus, we see that the United States stands 15th in the list of wine-making countries. The annual wine yield of this country is but a drop in the bucket of the world's supply, which, during the past five years, has averaged about 3,000,000,000 gallons per annum.

The consumption per capita of wine in the United States is very small compared with the immense quantities of wine consumed by the people of Continental Europe. It is hardly half a gallon per person per annum; that is to say,

with a population of 80,000,000 people, the consumption of wines in the United States is now about 40,000,000 gallons per annum. The city of Paris alone consumes almost that quantity of wine in a year.

Statistics show that Americans are a coffee-, beer-, and whiskey-drinking people. The daily use of light wines at table is confined to a comparatively small number in this country, mostly to those of foreign birth or parentage. There are those who believe that the drinking of light wines is conducive to temperance. Thus, they point to the example set by the millions of wine-drinking people of Europe, where almost every man, woman and child drinks his wine at meals, and where drunkenness is not the evil it is in other countries. However, the consumption of wine has been increasing year by year in the United States, and at the present rate it is likely to be doubled within the next 15 or 20 years.

The Wine Industry in the United States.—The wine industry in this country is of comparatively recent date and growth. In 1850 the total output of wine in the United States was not more than 250,000 gallons. In 1860 it was about 500,000 gallons. In 1870 it had risen to about 5,000,000 gallons. In 1880 the wine yield of the country was about 15,000,000. In 1890, when the statistics of viticulture were gathered for the first time in the United States, there were 307,000 acres of vineyards, and a production of over 24,000,000 gallons of wine. The census of 1900 showed a production of over 30,000,000 gallons of wine for the United States.

According to the "American Wine Press," as against the output of about 35,000,000 gallons of wine in 1902, the estimated yield of 1903 is about 33,500,000 gallons, as follows:

	Gallons
Southern States	1,500,000
New York	4,500,000
Ohio	3,000,000
Western States	1,000,000
California	21,000,000
All other States	500,000

Total wine crop.....33,500,000

The greatest progress in viticulture and wine-making has been made in California during the past 20 years. That Golden State with its great range of climate and with its variety of soils has an area almost equal to that of France. The production of wine in California began to assume large figures in 1877, when it was 4,000,000 gallons. In 1880 the yield was more than double, or 10,000,000 gallons. In 1890 the wine crop of California rose to fully 20,000,000 gallons. The estimated vintages of California wines during the years 1893 to 1903 have been as follows:

YEAR	Gallons
1893	22,000,000
1894	16,000,000
1895	14,000,000
1896	13,500,000
1897	34,000,000
1898	18,500,000
1899	21,430,000
1900	21,000,000
1901	22,300,000
1902	25,000,000
1903	23,000,000

Two Distinct "Types" of American Wines.—The wines produced in the United States are divided into two classes: (1) Wines made east of the Rocky Mountains; (2) wines of California and the Pacific Coast States.

WINE-BERRY — WINES

This division is due to the fact that there are two entirely different stocks, or kinds, of grapes grown in the United States.

East of the Rocky Mountains, only American or native varieties of grapes are grown.

In California and on the Pacific Coast, practically only European or foreign varieties of grapes are grown.

Therefore, our Eastern wines are of a different "type" from California wines, which for the most part resemble and have the well-known characteristics of their European prototypes.

The leading grape and wine-growing States east of the Rocky Mountains are: North Carolina, Virginia, New Jersey, New York, Ohio, Michigan, and Missouri. The bulk of the grapes grown in these States are still used for eating or table purposes.

Considerable progress in Eastern wine-making has been made in producing a fine quality of champagne by the French process of fermentation in the bottle. A number of brands of American champagne, in color, taste, sparkle, and purity, compare very favorably with the best imported kinds. The headquarters of the champagne industry in the United States is in the Lake Keuka region of Western New York, which produces about 75 per cent of the output. Considerable champagne is also produced in northern Ohio, and thus far only a small amount in California. The total production of American champagne is now estimated at more than 100,000 cases, or 1,200,000 bottles per year.

In conclusion, the manufacture of wine and champagne is an infant industry in the United States. But we have in the Eastern States and in California, all the opportunities and all the conditions for success. We have here the right climates, the proper soils, the best varieties of grapes, sufficient capital, and the most intelligent labor and supervision in the world. Therefore, with all these things, and with the growing demand and liking for wines, the wine industry should have a great and prosperous future.

Bibliography.—The best books on wines and wine making are in French or German. The following standard French works may be noted: Ladrey, 'L'Art de faire le Vin' (1882); Maumené, 'Traité théorique et pratique du travail des Vins' (1890); Coste-Floret, 'Procédés modernes de Vinification' (1895); Salleron et Mathieu, 'Etudes sur le Vin Mousseux' (1895); Sebastian, 'Les Vins de Luxe' (1897).

There are but few books in English of recent date on wine-making. We note the following: Thudichum & Dupré, 'Origin, Nature, and Varieties of Wine' (1872); Rixford, 'The Wine Press and the Cellar' (1883); Husmann, 'Grape Growing and Wine Making' (1897).

LEE J. VANCE,

Editor 'American Wine Press,' New York.

Wine-berry, a Japanese plant (*Rubus phacelarioides*), with long recurring canes which root at the tips and are clothed with red glandular hairs. The leaflets are usually three, white, tomentose beneath, and the flowers are in dense axillary clusters, forming a loose panicle. The bristly calyx-lobes enlarge in fruit, and enclose the immature berry as in a bur, but eventually spread apart; the mature fruit is small, soft, cherry-red in color, in flavor insipid or acid. The wine-berry is said to prolong the season of *Rubus* fruits, as it ripens in

September, and to be good for preserves. The plant is also interesting, especially in spring, for the shrubberies.

The grape, the whortleberry, the gooseberry, and the red and the black currants are called wine-berry; as are also the edible, berry-like fruits of the poisonous toad-plant (*Coriaria sarmentosa*), a large shrub of New Zealand.

Wine Measure, an old English measure by which wines and spirits were sold. The gallon contained 231 cubic inches.

Wine Press, a machine in which the juice is pressed out of grapes. The wine press of the Bible was a vat, in which the juice was expressed by the feet of men who trampled the fruit.

Winebrenner, win'bren-er, John, founder of the denomination known as the "Church of God": b. Frederick County, Md., 24 March 1797; d. 12 Sept. 1860. He was ordained a minister of the German Reformed Church in 1820, and was called in the same year to the Salem Church, Harrisburg, Pa. He retained that charge until 1827 when his outspoken attitude against slavery and the traffic in intoxicating drinks led to his being asked to withdraw, and in 1828 he ceased to be connected with the Reformed Church. In October 1830 he established the denomination called the "Church of God," whose members also became known as Winebrennerians. He edited for some time the 'Gospel Publisher,' afterward the 'Church Advocate,' and issued several works, including 'A Treatise on Regeneration'; 'Practical and Doctrinal Sermons'; the 'Church Hymn Book'; etc. See CHURCH OF GOD.

Winebrennerians. See CHURCH OF GOD.

Wines, Enoch Cobb, American penologist: b. Hanover, N. J., 17 Feb. 1806; d. Cambridge, Mass., 10 Dec. 1879. He was graduated from Middlebury College, Vt., in 1827, taught school in Philadelphia and Burlington, N. J., and entering the Congregationalist ministry in 1849 held pastorates at Cornwall, Vt., and Easthampton, L. I. He became secretary of the New York State Prison Association in 1862, and afterward devoted his life to the promotion of reform in the administration of criminal law and treatment of criminals. He founded the National Prison Association in 1870 and was instrumental in securing the attendance of representatives from 26 governments at the International Penitentiary Congress in London 4 July 1872. Among his writings are included: 'Two Years and a Half in the Navy' (1832); 'A Trip to China' (1832); 'Hints on Popular Education' (1838); 'Prisons and Reformatories in the United States and Canada' (1867); 'State of Prisons and Child-Saving Institutions' (1880).

Wines, Frederick Howard, American statistician, son of E. C. Wines (q.v.): b. Philadelphia, Pa., 9 April 1838. He was graduated at Washington College, Pa., in 1857, and studied at Princeton Theological Seminary; was a chaplain in the Union army 1862-4; pastor of the First Presbyterian Church, Springfield, Ill., 1865-9, was secretary of the Illinois State Board of Commissioners of Public Charities 1869-93, and again 1897-9. He was made assistant director of the United States census in 1899.

WINFIELD—WINLOCK

His publications include: 'Defective, Dependent, and Delinquent Classes in the United States' (10th Census); 'Crime, Pauperism, and Benevolence in the United States' (11th Census); 'Punishment and Reformation' (1895); 'Liquor Problem in Its Legislative Aspects'; etc.

Winfield, Kan., city, county-seat of Cowley County; on the Walnut River, and on the Missouri Pacific, the Atchison, T. & S. F., and the St. Louis & S. F. R.R.'s; about 40 miles southeast of Wichita. It was settled in 1870, and in 1871 was incorporated. The chief industrial establishments are flour mills, grain elevators, machine shops, and stock yards. In the vicinity are limestone quarries. In 1900 (government census) Winfield had 75 industrial establishments, capitalized for \$588,481, whose annual finished products brought \$1,136,346. It has two schools of college rank; Saint John's Lutheran College, opened in 1893; and Southwest Kansas College (M. E.), opened in 1886. Other educational institutions are a public high school, Winfield Business and Academic College, public graded schools, a public and school libraries. The State Imbecile Asylum of the Southwest is located here. The three banks have a combined capital of \$200,000 and deposits (1903) amounting to \$1,470,750. Pop. (1910) 6,700.

Wing, an organ of flight. In birds, the wings consist of the bones of the fore limbs, specially modified to form a support and axis, while attached to this skeleton are the muscles moving the limb (see ORNITHOLOGY), externally clothed with strong flight-feathers or 'wing quills.' (See FLIGHT.) In the bat (q.v.) the wing consists of an expansion of the skin, supported on four of the fingers, which are extremely long. This leather-like membrane, or 'patagium,' extends from the fore limbs to the hind limbs, and in many cases between the hind limbs and tail as well. In such mammalia as the flying-foxes, flying-squirrels, flying phalangers, and in the lizards known as flying-dragons (qq.v.), the wing is a mere expansion of skin, extending along the sides of the body, often connecting hind and fore limbs, and serving as a parachute to sustain the animals in their flying leaps from tree to tree, but in no sense serving as an organ of true flight. In insects (q.v.), the wing is formed of two delicate skin layers, supported on hollow tubes or *nervures*, placed in communication with the respiratory or breathing system. The wings of insects become thus related to respiration, and by their movements probably aid in the diffusion of air through the breathing tubes.

Wingate, George Wood, American lawyer: b. New York 1 July 1840. He was educated in the public schools, and served with the 22d New York Volunteers during the Civil War. He originated systematic rifle practice for the instruction of the National Guard, and through his efforts the Creedmoor rifle range on Long Island was established. He was president of the National Rifle Association for 25 years, and is the author of 'Wingate's Manual of Rifle Practice' (1872); 'The Great Cholera Riots' (1880); 'On Horseback Through the Yellowstone' (1886); 'History of the 22d Regiment' (1896); etc.

Winged Bull, in architecture, a decoration of frequent occurrence in ancient Assyrian temples, where winged human-headed bulls and lions of colossal size usually guarded the portals.

Winged Lion, the symbol of the evangelist Saint Mark, which was adopted as the heraldic device of the Venetian Republic. A celebrated bronze figure of the winged lion of Saint Mark surmounting a magnificent red granite column, formed out of a single block, stands in the Piazzetta of Saint Mark at Venice.

Wing'abell, the name of several bivalve shells, which have wing-like extensions of the hinge-margin, as *Unio alatus*, or are wing-shaped; especially species of the genus *Pinna*. See PINNA.

Winifred, Wenefride, or Winefride, Saint, according to the legend, a noble British maiden, possibly of the 7th century, whose head the Prince Caradoc cut off when she fled from his unholy proposals. The head rolled down a hill, and where it stopped a spring gushed forth; famous afterward as a place of pilgrimage, Holywell in Flintshire. She was restored to life by Saint Bueno, who replaced her head, survived the miracle 15 years, and after the death of Saint Bueno entered the nunnery of Gutherin, in Denbighshire. Her festival is observed on 3 November.

Winkelried, vink'el-réd, Arnold von, Swiss patriot. He was a knight of the Swiss canton of Unterwalden, whose self-sacrificing valor is said to have decided the victory of Sempach, 9 July 1386. The Austrian troops, under Archduke Leopold, were formed into a compact body which resisted the efforts of a small body of Swiss drawn up in the form of a wedge and rushing to the attack. The Austrians were now beginning to surround their enemies when Winkelried, seeing the desperate condition of affairs, burst from the ranks, threw himself upon the ranks opposed to him, and, grasping all the pikes within his reach, buried them in his bosom, and bore them by his weight to the earth. Over his dying body his companions rushed into the opening he had made in the Austrian line and defeated their enemy with great slaughter. The truth of this legend has been much discussed, but in 1886 a monument to Winkelried was raised at Stanz, Unterwalden. Consult: H. Von Liebenau, 'Arnold von Winkelried, seine Zeit und seine That' (1862); Kleissner, 'Die Quellen zur Sempacher Schlacht und die Winkelried Sage' (1873); Burkli, 'Der wahre Winkelried: die Taktik der alten Urschweitzer' (1886); T. Von Liebenau, 'Die Schlacht bei Sempach.'

Winkle, a local name about Long Island Sound and New York Bay for either of the large conchs (q.v.), *Fulgur* and *Sycotypus*, which are extremely common and very destructive to cultivated oysters. Their shells were utilized by the Indians as spoons, ladles, digging-tools, etc.; and out of their central columns were made the inferior beads called 'white wampum.'

Winlock, Joseph, American astronomer: b. Shelbyville, Ky., 6 Feb. 1826; d. Cambridge, Mass., 11 June 1875. He was graduated from Shelby College in 1845 and in that year was appointed professor of mathematics and astron-

WINNEBAGO — WINNIPEG

omy there. He was engaged as one of the computers in the office of the 'American Ephemeris and Nautical Almanac' in 1852-6, and in the last mentioned year was appointed professor of mathematics in the United States navy. He shortly afterward returned to the office of the 'Nautical Almanac' as second superintendent, but in 1859-61 was at the Naval Academy at Annapolis, Md., in charge of the mathematical department; on the outbreak of the Civil War he resumed direction of the 'Almanac.' In 1866 he was appointed to the chair of astronomy at Harvard, at the same time becoming director of the observatory at Cambridge, in which offices he continued until his death. He was elected by Congress to the National Academy of Sciences in 1863, was in charge of the expedition to Kentucky to observe the solar eclipse of August 1869 and of that to Spain in December 1870. He made numerous and important improvements in the equipment of the Harvard Observatory, and his researches and observations were of great scientific value.

Winnebago (Algonquian name: "Turbid water people"), an important tribe of the Siouan stock of North American Indians, who are closely related to the Chiwere division (the Iowa, Oto, and Missouri) and to the Mandan. Their own name is *Hochângara*, "People of the parent speech." They were first mentioned in the Jesuit Relation of 1636, but the first use of the name Winnebago occurs in the Relation of 1640. It is said that they were almost annihilated by the Illinois tribe in early days, and that the historical group was made up of the survivors of this warfare. In 1639 they were on Green Bay, Wis.; in 1736 they resided on Lake Superior, but by 1761 they were again on Green Bay and in 1768 had a village on a small island in Winnebago Lake. In 1822 their population was estimated at 5,800 and their country extended from Winnebago Lake southwestward to the Mississippi. By treaty of 1805 and 1832 they ceded their lands south of Wisconsin and Fox rivers for a reservation on the Mississippi above the Oneonta; in the latter year one of their villages was at Prairie la Crosse. They suffered several visitations of smallpox; the third, which occurred in 1836, carried off more than a quarter of the tribe. A part of the Winnebago long remained widely distributed over their old country east of the Mississippi and along that river in Iowa and Minnesota; in 1846 they surrendered their reservation for another above the Minnesota, and in 1856 they were removed to Blue Earth, Minn. Here they were mastering agriculture when the Sioux war broke out and the settlers demanded their removal. Those who had taken farms were permitted to remain, but the others were taken to Crow Creek, on the Missouri, whence they soon escaped; but their privations and sufferings were such that of the 2,000 removed to Crow Creek, only 1,200 reached the Omaha reservation, whither most of them had fled. These survivors were assigned a new reservation on the Omaha lands, where they remain, allotted lands in severalty. There are now 1,131 under the Omaha and Winnebago Agency, Nebraska, and 1,403 in Wisconsin. See McGee, 'Siouan Indians' (14th Rep. Bureau Amer. Ethnology, Washington, 1897).

Winnebago, win-ê-bâ'gô, a lake in the eastern part of Wisconsin, the largest in the State. It is about 750 feet above sea-level, nearly 28 miles long and 10 miles wide in the broadest part; area, 212 square miles. It has an abundance of fish. Its clear waters, well wooded shores, with the pretty towns intervening, make it most attractive. On the east shore is found a curious wall made by stones being pressed against the shore at times of ice expansion. The Fox River is both an inlet and an outlet of the lake. It is navigable from its mouth at the head of Green Bay; so Lake Winnebago has steamer connections, by means of the Fox River and Green Bay, with the Great Lakes.

Winnemucca, win-ê-mûk'ka, Nevada, town, county-seat of Humboldt County; on the Humboldt River, and on the Southern Pacific Railroad; about 170 miles northeast of Reno. It is in a silver mining region, and is surrounded by some excellent farm lands. It has large shipments of live-stock, beef, and wool, and some grain. The national bank has a capital of \$25,000, and, in 1903, deposits of \$626,170. Pop. (1910) 1,786.

Winnemucca, a lake in the western part of Nevada. It is in a desert valley in which is Pyramid and several other lakes. Winnemucca is 26 miles long, north to south, from two to five miles wide, and from 50 to 87 feet deep. Truckee River is the only inlet, which is also an inlet of Pyramid Lake. It has no apparent outlet. The mineral matter, chiefly salt, is 36 parts per 1,000.

Winnepesaukee ("Beautiful water of the high land"), a division of the Pennacook confederacy of the Algonquian stock of North American Indians, formerly inhabiting the vicinity of Winnepiscogee Lake, New Hampshire.

Winnishah. See OJANAKICHE.

Winnipeg, Canada, a city, capital of the province of Manitoba, situated on the prairie at the junction of the Assiniboine and Red rivers, which latter runs north from the city for 45 miles and empties into Lake Winnipeg, an immense body of water encircled by the forest and noted for the abundance and excellence of its whitefish. Winnipeg is the midway city between the Atlantic and Pacific oceans on the Canadian Pacific, a transcontinental railway of Canada. The city is likewise equidistant from the shore of the Gulf of Mexico on the south and the Arctic Sea on the north. Winnipeg is a railway city of radial importance. In addition to its communications east and west on the main line of the Canadian Pacific Railway, it has also the Emerson, Gretna, Deloraine, Glenboro, Lac du Bonnet, Teulon and Lake Winnipeg branches running to different parts of the province. Another great railway running from Lake Superior to Edmonton—a stretch of 1,500 miles—the Canadian Northern, has its centre in Winnipeg. It has as branches the Emerson, Neepawa, Lake Manitoba, and Hudson Bay lines, while divisions east through Ontario and Quebec and west in British Columbia are being hastened to be a transcontinental railway.

Winnipeg is also the headquarters of the Grand Trunk Pacific Railway, which has its western terminus at Prince Rupert on the Pa-

WINNIPEG.

1. Law Courts.
- 2 City Hall Square, with Municipal Building on the left.

cific and will reach tidewater at St. John, New Brunswick, on the Atlantic.

Winnipeg has likewise navigation down the Red River, by means of the completed lock at St. Andrews to Lake Winnipeg, and when the Grand Rapids on the Saskatchewan are overcome will have water communication to the foot of the Rocky Mountains.

The city has twelve substantial bridges across the Red and Assiniboine rivers. Those across Red River connect with Elmwood and St. Boniface, important suburbs. And south of the Assiniboine are Fort Rouge, Crescentwood and Winnipeg South.

Trade and Commerce.—In trade Winnipeg is the great city of western Canada, and is the centre of the wholesale and jobbing trade of the Canadian west. Being the grain shipping port eastward from the prairies the city may be compared to a great elevator spout through which the products of the West reach the markets of the world. It is the largest wheat exporting centre, it is said, in the world.

The two great water power electric companies of Pointe du bois (Circ) and Lac du Bonnet both bring power fifty miles from Winnipeg River. Cheap power is making the city an important manufacturing centre after the model of Chicago. At present the industries established in the city are furniture and upholstery, brooms and brushes, oatmeal, flour and grist mills, awnings, tents, and mattresses, clothing, bookbinding, carriage works, soda water works, breweries, biscuit, confectionery, and baking products, coffee and spice mills, harness and saddlery, marble works, tinware, sash, door and boxes, saw-mills, cigar factory, oil-mills, plumbing and gas, tanneries, soap, jewelry, etc.

The city has retained a number of its municipal franchises. The water supply is obtained from a system of artesian wells, which supply good water from the limestone rock at a depth of sixty feet.

Originally begun on a bare prairie of black alluvium, the city has, during the last seven years, devoted much attention to street and other improvements. Numerous parks in different parts are tastefully laid out and cultivated. Trees have been planted and boulevards constructed at the public expense, and so marked has been the transformation that it is now proposed to change the name the "Prairie City" to the "Elm City".

The city has 207 factories employing 15,000 hands, with a constantly increasing output as shown by the following figures: 1900, \$8,606,248; 1905, \$18,983,248; 1910, \$36,000,000.

Finances, etc.—As being the trade centre of western Canada, Winnipeg is also the financial headquarters of the region. Indeed, Winnipeg stands third as a financial centre in Canada, coming after Montreal and Toronto. There are doing business in the city as chartered banks 19 main and 26 branches, representing a paid-up capital of \$102,000,000, and including almost all the leading banks of Canada. The bank clearings were: 1908, \$614,111,801; 1910, \$953,415,281; 1911, \$1,172,762,142. Almost all the loan and investment companies of Canada are represented as well as the fire and life insurance companies of eastern Canada with a number of local western companies. The total

city assessment was: 1900, \$25,077,400; 1906, \$80,511,727; 1911, \$172,677,250. The annual expenditure for building was: 1909, \$9,226,325; 1910, \$15,116,450; 1911, \$17,550,000.

Religion.—The leading religious bodies are represented by some 80 or 90 churches. In the province and city the religious bodies best known, in the order of their numbers, are: Presbyterian, Church of England, Methodist, Roman Catholic, Lutheran, Baptist, and Congregational. The most stately church buildings are Holy Trinity, Knox, Saint Mary's (Roman Catholic), Westminster, Central, Augustine, St. Stephen's, Broadway Methodist, Grace, St. Andrews, St. Giles and Icelandic Lutheran. The population of Winnipeg is noted as being one of the most church-going on the continent. The religious harmony of the city is remarkable, truly catholic feeling pervading all classes.

Education.—In education the city stands out prominently. Its public school buildings are probably unsurpassed as a whole for architecture, completeness and comfort by any other city in the world. Specialists are appointed in music, drill, sewing, drawing, nature study, manual training, household science, etc. The highest in the system is the collegiate institute, a classical school, and in 1912 two technical high schools have been added at a cost of \$700,000. The education of teachers for the province is conducted in the normal school, which is situated in the city. The literary taste is cultivated by the Carnegie Library, free to all classes of citizens. A public museum and picture gallery are under way of construction. Winnipeg is also the seat of the University of Manitoba. This is an unique institution. It is provincial and has confided to it the sole power of granting degrees, of conducting all examinations in arts, medicine, the entrance in law, surveying, and civil engineering. This year 1200 candidates have been examined by the university. The university has an endowment in lands of 150,000 acres, now estimated at a million and a quarter of dollars, of which about one third have up to date been sold. The university is well equipped, occupying a spacious building on a plot of seven acres on Broadway, where other necessary buildings may be erected. Besides council chamber, offices, and examination hall, the university teaching in science is accommodated in this building, good laboratory facilities being supplied the professors. The university has accepted a new site, given freely, near Tuxedo Park in the west of the city. The site is of 166 acres. In the south of the city is the Manitoba Agricultural College—a large and successful institution. The school attendance has grown as follows: 1871, 1 teacher, 35 pupils; 1900, 119 teachers, 7,500 pupils; 1910, 340 teachers, 17,736 pupils; 1911, 375 teachers, 21,219 pupils. The specially notable character of the university is its group of affiliated colleges. These are four classical colleges, namely, Saint Boniface (Roman Catholic), Saint John's (Church of England), Manitoba (Presbyterian), Wesley (Methodist), along with a Medical College and a College of Pharmacy. For all these the university lays down the curriculum and conducts the examinations. They have large and attractive buildings and grounds,

WINNIPEG—WINONA

full staffs of professors, strong financial support, and are a powerful influence in the city. Of other educational institutions there are Havergal College (Church of England) and Saint Mary's Academy (Roman Catholic) for girls.

Charities.—With charitable institutions the city is well provided. The Winnipeg General Hospital, Saint Boniface General Hospital, and several private hospitals are doing successful work, to the first named a Nurses' Home and Maternity Hospital being attached. The Women's Home, Children's Home, Children's Aid Shelter, Old Folks' Home, Saint Mary's Boys' Home, and Free Kindergarten Institution bear testimony to the energy of charitable ladies. Several cemeteries make up the city of the dead in the suburbs of Winnipeg. These are Saint John's, Kildonan, Saint James', Elmwood, and that belonging to the city—Brookside, besides Saint Boniface and another Roman Catholic cemetery in the south of the city.

History.—The history of the city of Winnipeg is based on that of an earlier historical movement. The city includes the site of Fort Garry—the Mecca of the Hudson's Bay Company traders of Rupert's Land. Indeed, Fort Garry was not the first. In 1738 Fort Rouge, on the south side of the Assiniboine, was built by a lieutenant of Verendrye, the French explorer. In 1804 Fort Gibraltar was erected by the Montreal fur traders. In 1812-14 Fort Douglas, as the centre of settlement, was undertaken by the officers of Lord Selkirk, the Scottish colonizer. This was the true beginning of Manitoba and Winnipeg, when a band of Scottish Highlanders founded a farming settlement on Red River, coming in by way of Hudson Bay. Fort Garry (1) was built in 1822, Fort Garry (2) in 1835, the latter a beautiful stone fort. This became the seat of government in the Hudson's Bay Company and Red River Settlement. In 1870 Rupert's Land was transferred to Canada, and the village of Winnipeg then began as a small nucleus of houses half a mile from Fort Garry. From this hamlet sprang into being Winnipeg, which was incorporated as a city in 1873. It is now a metropolis with a great future. That there are to be three great cities in Canada: Montreal, Winnipeg, and Vancouver, is now the voice of the prophets. Winnipeg is a cosmopolitan city, having some 20 or 30 nationalities represented in considerable numbers, but all heartily united in one Canadian spirit. Few cities on the American continent present such marvelous progress as this.

Population.—The population of the city has been, including suburbs: (1902), 48,411; (1904), 67,262; (1908), 128,000; (1910), 151,450; (1911), 172,000.

GEORGE BAYCE,

Author of the Remarkable History of the Hudson's Bay Company, etc.

Winnipeg, Lake, Canada, is in the provinces of Saskatchewan and Manitoba and the district of Keewatin, and lies at an altitude of 710 feet above sea-level, between 50° 20' and 53° 50' north latitude and 96° 20' and 99° 15' west longitude. It is 250 miles long, 25 to 70 miles wide and covers an area of over 8500 square miles. It contains a number of islands, the longest being *Reindeer* and *Big Island* embracing respectively 70 and 60 square miles. It

receives the surplus waters of Lakes Winnipegosis and Manitoba and discharges by Nelson River in a northeasterly direction into Hudson Bay. The principal rivers flowing into it are, from the south, Red River, from the west, Dauphin and Saskatchewan Rivers; and from the east, Winnipeg, Bloodvein, Berens and Poplar Rivers. Lake Winnipeg is comparatively shallow, nowhere reaching the depth of 100 feet, a consequence being that its frequent storms are often exceedingly dangerous; this feature is augmented by its exposed condition owing to the low character of its shores which, on the south, are also very marshy. Fish in abundance are found in its waters, the white fish being widely known and valued on account of their size and flavor.

Winnipeg, River, Canada, rises near Savanne in 48° 47' north latitude and 89° 57' west longitude, and flows in a general westerly direction under the names of Savanne, Seine and Rainy Rivers into the Lake of the Woods. After it leaves this lake it is known as Winnipeg River and follows an extremely tortuous and often turbulent course until it finally discharges into Lake Winnipeg. It is navigable for a distance of 208 miles.

Winnipegosis, win-t-pé-goo'sis, Lake, a lake in northwestern Manitoba, extending into Saskatchewan. It lies to the west of Lake Winnipeg (q.v.) and parallel with it; its length is 127 miles, the width 17 miles; its elevation above sea-level 828 feet. It is generally shallow, the greatest depth not being over 40 feet. It receives the Red Deer and Swan rivers, and a few other smaller streams, and discharges into Lake Manitoba to the southeast, through the Water Hen River.

Winnipiseogee, win-t-pé-sá-gé, a lake in the east central part of New Hampshire. Its average length is 25 miles; width from one to 10 miles, area 178 square miles; and 475 feet above sea-level. The outlet is Winnipiseogee River, which flows into the Merrimack River. It has an irregular coast line, and contains a number of islands. The waters abound with fish. There are many summer cottages on the islands and along the shores.

Winna'bora, S. C., city, county-seat of Fairfield County; on the Southern Railroad; about 34 miles north of Columbia. It is in an agricultural region, and in the vicinity are large stone quarries. At one time the city manufactured all the cotton-gins used in the United States. The educational institutions are Mount Zion Institute, established in 1878, as a public high school, but chartered as a school in 1777, and graded elementary schools. The bank has a capital of \$120,700. Pop. (1890) 1,738; (1900) 1,765; (1910 est.) 1,800.

Winona, wi-no'na, Minn., city, county-seat of Winona County; on the Mississippi River, and on the Chicago, Milwaukee & Saint Paul, the Chicago, Burlington & Quincy, the Green Bay & Western, the Winona & Western, and the Chicago & Northwestern R.R.'s; about 105 miles southeast of Saint Paul. The surrounding scenery is most picturesque, the peculiar rocks in and near the city are of interest. Sugar Loaf and Trempealeau Mountains are remnants of once lofty elevations, but are now included with the high bluffs which border the city. The

A HERD OF WINNIPEG BUFFALO

WINONA — WINSLOW

city has steamer connection with all the Mississippi River ports, and the bridges which span the river at this point connect the city with places in Wisconsin. It is in an agricultural and stock-raising region.

The chief manufacturing establishments are flour and lumber mills, agricultural-implement works, wagon and carriage factories, railroad shops, breweries, and patent medicine works. In 1909 (government census) Winona had 99 manufacturing establishments which were capitalized for \$7,879,000 and in which were employed 2,404 persons, who received annually wages to the amount of \$1,438,000. The total cost of the raw material used each year was \$7,330,000 and the value of the finished product was \$11,200,000. Winona has excellent transportation facilities and ships annually large quantities of grain, hay, vegetables, lumber, and live stock.

The principal public buildings are the government buildings, the court-house, municipal buildings, the Winona General Hospital, the Margaret Simpson Home, opera house, churches, and schools. There are 24 churches including a Roman Catholic cathedral. The educational institutions are a State normal school, established in 1868; Winona Seminary (R. C.), for young women, a public high school, opened in 1887, 10 public and four parish schools, Toland's Business University, and several private schools. There are five banks, which have a combined capital of \$700,000, and deposits amounting to about \$5,200,000. The city owns and operates the water-works.

Winona was settled in 1851 and in 1852 was laid out as a town. In 1857 it received a city charter. Its growth has been somewhat rapid; but it has had no fictitious booms nor serious drawbacks. Pop. (1890) 18,208; (1900) 19,714; (1910) 18,583.

Winona, Miss., town, county-seat of Montgomery County; on the Southern and the Illinois Central R.R.'s; about 85 miles north by east of Jackson. It is in an agricultural region in which cotton and grain are the chief products. It has flour and grist mills, cotton gins, and agricultural implement works. The two banks have a combined capital of \$150,000. The high school was established in 1887. Pop. (1910) 2,500.

Winoski, Vt., village in Chittenden County; on the Central Vermont Railroad; two miles north of Burlington. It has an electric railway to Burlington. It is in a fertile agricultural region, and has considerable manufacturing interests. The chief industrial establishments are sash, door, and blinds factories, wagon and carriage works, cotton and woolen mills, iron and brass works, machine shops, flour mill, and furniture factory. It has a high school, Providence Academy (R. C.), public and parish schools, and the Fanny Allen Hospital. There is one bank with a capital of \$55,000 and deposits of about \$1,000,000. Pop. (1910) 4,520.

Winoski, or Onion, a river in Vermont, which has its rise in the northeastern part of the State, flows west, breaking through the Green Mountains, and enters Lake Champlain about five miles northwest of Burlington. Total length about 100 miles. In several places it has cut deep picturesque gorges, and it has

several falls. The falls at Middlesex and Winoski furnish extensive water-power for manufacturing. The valley of the Winoski is noted for its beautiful scenery.

Winship, George Parker, American author and librarian: b. Bridgewater, Mass., 1871. He was graduated from Harvard in 1893, was assistant in history there in 1893-5, and has since been in charge of the John Carter Brown Library, Providence, R. I. He has written: 'The Coronado Expedition' (1896); 'Geoffrey Chaucer' (1900); 'Cibola Bibliography' (1900); etc., and has edited Wafer's 'Darien' (1903); and 'The Harris Papers' (1903).

Winalow, winz'16, Edward, American colonial governor: b. Droitwich, Worcestershire, England, 19 Oct. 1595; d. at sea, between Santo Domingo and Jamaica, 8 May 1655. While making a tour of the Continent he became a member of John Robinson's Leyden congregation. He was one of the passengers in the Mayflower, and in the first conference with Massasoit offered himself as a hostage, and won the attachment of the Indian chief, which he increased in 1623 by curing him of a severe illness. After the death of his wife during the first winter at Plymouth he married Mrs. Susannah White, mother of Peregrine White, her husband having died in that same winter also, and theirs was the first marriage in New England. In 1623-4 he made two voyages to Europe as agent for the colony, of which he was chosen governor in 1633, 1636, and 1644. While visiting England again in 1639, as agent for the colony, he was imprisoned by Laud in the Fleet prison for 17 weeks on the charges of having taught in the church, although a layman, and of having performed marriage as a magistrate. Another voyage was made by him in 1646 to answer charges against the colonists of religious persecution and intolerance. In 1649 he again visited England, was instrumental in the organization of the society for the propagation of the gospel in New England, and was employed in various public affairs under the Commonwealth. In 1655 Cromwell appointed him one of three commissioners to superintend an expedition against the Spaniards in the West Indies, and he died before its completion. He was the author of several works, mostly controversial writings in defense of New England. The principal are 'Good News from New England' (1624); 'Hypocrisie Unmasked' (1646); 'The Danger of Tolerating Levellers in a Civil State' (1649); and 'Glorious Progress of the Gospel amongst the Indians' (1649). These have been reprinted by the Massachusetts Historical Society.

Winalow, Forbes Benignus, English alienist: b. London, of a Massachusetts family, August 1810; d. Brighton, Sussex, 3 March 1874. He came to this country in early life, studied medicine in New York, was graduated from the College of Surgeons, London, in 1835, and took his M.D. at Aberdeen. Having after 1830 paid special attention to the study of insanity, he opened a private asylum at Hammersmith, and later another in London, and came in time to be a supreme authority on all relating to diseases of the brain. He founded and edited the 'Quarterly Journal of Psychological Medicine and Mental Pathology' (1848) and the 'Medical Critic' (1861), was the juridical and president

of the Medical Society of London (1853), and a member of numerous scientific bodies. He published: 'The Application of Phrenology to the Elucidation and Cure of Insanity' (1831); 'Anatomy of Suicide' (1840); 'Plea of Insanity in Criminal Cases' (1843); 'Notes on the Lunacy Act' (1845); 'Softening of the Brain' (1849); 'Lethaesian Lectures on Insanity' (1854) 'Obscure Diseases of the Brain and Disorders of the Mind' (1860; 4th ed 1868); 'Light, its Influence on Life and Health' (1869); etc.

Winslow, Hubbard, American Presbyterian clergyman: b. Williston, Vt., 30 Oct. 1799; d. there 13 Aug. 1864. He was graduated from Yale in 1825 and from Yale Theological Seminary in 1828. He was pastor of the First Church, Dover, N. H., 1828-32, and of the Bowdoin Street Church, Boston, 1832-44, and during the next 10 years was the principal of the Mount Vernon Young Ladies' Institute at Boston. He edited the 'Religious Magazine' 1837-40, lectured widely on religious and secular topics, was pastor of the First Presbyterian Church, Geneva, 1857-9, and of the Fifth Street Presbyterian Church, New York, 1861-2. He was a voluminous writer, and among his works may be cited 'The Doctrine of the Trinity' (1831); 'Controversial Theology' (1832); 'The Appropriate Sphere of Woman' (1837), republished as 'Woman as She Should Be' (1838); 'Elements of Intellectual Philosophy' (1852); 'The Hidden Life' (1863).

Winslow, John, American soldier: b. Plymouth, Mass., 27 May 1708; d. Hingham, Mass., 17 April 1774. In 1740 he was appointed by the council captain of a company recruited in Boston for the expedition against Cartagena (q.v.); and in June 1754 sailed in the provincial ship Massachusetts to build a fort on the Kennebec. This he began on a point half a mile below the Tecumuck Falls, where it was finished by William Lithgow in the next year. With Scott he was a commander of the 1,800 troops sent by New England in 1755 to remove the French from the posts established on the Bay of Fundy. The French forts at Beauséjour and Gaspereau were taken, and on 11 August Winslow, then with rank of lieutenant-colonel, and in command at Mines, was instructed to remove the Acadians in his vicinity, a task which he described to the French inhabitants as "very disagreeable." He strictly followed his orders, however, as "it is not my business to animadvert." In 1756 he was appointed to command the campaign on Lake Champlain, holding now the grade of major-general, and was stationed at Fort William Henry. He led another expedition to the Kennebec in 1758-9, and subsequently was chief justice of the court of common pleas for Plymouth County, and a member of the legislature and the council. He was associated with Samuel Adams in the preparation of documents regarding the Stamp Act troubles.

Winslow, John Ancrum, American naval officer: b. Wilmington, N. C., 19 Nov. 1811; d. Boston, Mass., 29 Sept. 1873. He was appointed midshipman in the navy in 1827, was promoted lieutenant in 1830, and served in the Mexican War, participating in the expeditions against Tabasco, Tampico, and Tuspan. He was made commander in 1855, in 1861 joined the Mississippi flotilla, and in 1866 was commissioned cap-

tain. In 1863-4 he was in command of the steamer Kearsarge, assigned to the special duty of pursuing the Confederate privateer Alabama. On 14 June 1864 he found the Alabama off Cherbourg, France, and blockaded her in that harbor until 19 June, when Captain Semmes notified Winslow of his intention to fight. The Kearsarge steamed seven miles out from shore in order to be on neutral waters, and then turned to meet the privateer. The Alabama fired the first shot, and the battle continued for an hour and a half, the vessels fighting in circles, which brought them constantly closer until the distance between them was but 600 yards. The Alabama then began to sink and raised the white flag. Winslow numbered but three killed and wounded out of his crew of 163 officers and men, and took 65 prisoners. It was the most important sea fight of the war between two ships, and Captain Winslow received a vote of thanks from Congress, and was promoted commodore, his commission dating from the hour of his victory. He was in command of the Gulf squadron in 1866-7, was promoted rear-admiral in 1870, and was commander-in-chief of the Pacific squadron in 1870-2.

Winslow, Josiah, American colonial governor, son of Edward Winslow (q.v.); b. Marshfield, Mass., 1629; d. there 18 Dec. 1682. From the command of the Marshfield military company in 1652 he rose to the rank of major and commander-in-chief of the forces of the Plymouth colony in 1658. He was chosen deputy in 1657, and was one of the commissioners of the united colonies from 1658 to 1670. He was assistant governor of the Plymouth colony for several years prior to 1673, and from that date till his death was its governor, the first native-born governor in New England. During King Philip's War he was *ex officio*, and, according to rank, general-in-chief of the entire army of the united colonies. He wrote a poem commemorative of Governor Bradford, which may be found in Morton's 'New England Memorial' (1669).

Winslow, Miron, American missionary: b. Williston, Vt., 11 Dec. 1789; d. Cape of Good Hope, Africa, 22 Oct. 1864. He was graduated from Middlebury College, Vt., in 1815 and from Andover Theological Seminary in 1818. He went as a missionary of the American Board to Ceylon 1819, and continued in the mission field for 44 years. He founded the Madras mission 1836; was president of the native college at Madras 1840; translated the Bible into Tamil 1835, and published 'A Tamil and English Dictionary' (1862), a great work, containing over 67,000 Tamil words.

Winslow, William Copley, American Egyptologist, son of Hubbard Winslow (q.v.): b. Boston, Mass., 13 Jan. 1820. He was graduated from Hamilton College, Chilton, N. Y., in 1862 and from the General Theological Seminary, New York, in 1865. He took orders in the Episcopal Church, was rector of Saint Luke's Church, Lee, Mass., 1867-70, and for many years secretary of the Free Church Association in the Episcopal Church. He was assistant editor of the New York *World* 1862-3, and editor of the 'Christian Times' 1863-5, and was long vice-president, secretary, and treasurer of the Egypt exploration fund for the United States. He has written: 'Israel in Egypt':

WINSOR — WINSTON-SALEM

'The Store City of Pithom' (1885); 'A Greek City in Egypt' (1887); 'The Egyptian Collection in Boston' (1890); 'The Pilgrim Fathers in Holland' (1891); 'Governor Edward Winslow'; etc.

Winsor, win'sôr, Justin, American historian and librarian. b. Boston, Mass., 2 Jan. 1831; d. Cambridge 22 Oct. 1897. He was educated at Harvard and subsequently studied at Paris and Heidelberg. He was superintendent of the Boston Public Library 1866-77, and librarian of Harvard 1877-97. He published: 'History of the Town of Duxbury' (1849); 'Bibliography of Original Quartos and Folios of Shakespeare' (1875); 'Reader's Handbook of the American Revolution' (1880); 'Memorial History of Boston' (edited 1880-2); 'Narrative and Critical History of America' (edited 8 vols. 1884-9), his most scholarly achievement; 'Christopher Columbus' (1891); 'From Cartier to Frontenac' (1894); 'The Mississippi Basin: The Struggle in America between England and France' (1895). He ranked as the highest authority on the early history of North America.

Win'sted, Conn., borough, county-seat of Litchfield County; on the Mad and Still rivers, and on the Central N. E. and the New York, N. H. & H. R.R.'s; about 28 miles northwest of Hartford. It is in an agricultural region, and is the commercial and industrial centre for quite an extent of country. The Mad River furnishes considerable water-power, which is utilized for manufactories for cutlery, clocks, leather, spool silk, edge tools, pins, hosiery, and undertakers' supplies. The town of Winchester, in which is the borough of Winsted, had, in 1900 (government census), 133 manufacturing establishments, capitalized for \$2,971,429, and employing 1,746 wage earners. The value of the annual products was \$2,928,822. From 1900 to 1904 the manufacturing industries have increased; the number of employees (1904) is now about 3,000. The educational institutions are Gilbert High School, Saint Margaret of Cortona Academy, public and parish schools, and the Memorial and Gilbert School libraries. Located in Winsted are the Litchfield County Hospital of Winchester, Old People's Home, and the Gilbert Home for Indigent Children. There are four banks, which, in 1903, had deposits amounting to \$3,737,080. Winsted receives considerable water-power from Long Lake, a body of water on the western side of the borough; and the water-supply comes from Crystal Lake.

The place was settled in 1756. The town of Winchester was founded in 1771, and Winsted was incorporated as a borough in 1858. The government is vested in a warden and six burgesses. Pop est 7,000. Pop of the town of Winchester (1900) 7,763; (1910) 7,754.

A. B. STEVENS,
'Winsted Daily Citizen.'

Win'ston, John Anthony, American politician: b. Madison County, Ala., 4 Sept. 1812; d. Mobile, Ala., 21 Dec. 1871. He was educated at Lagrange College, Ala., and at the University of Nashville, Tenn., and subsequently engaged as a cotton planter and commission merchant. He was elected to the State Assembly in 1839-40, and in 1842; to the State Senate in 1845, serving until 1852; and was president of that body in 1845-8. At the Baltimore convention

of 1848 he was the recognized leader of the Alabama Democracy, and in 1853-6 was governor of his State. He was the first native-born governor of Alabama, and by his refusal to sign certain bills for aiding railroad companies by State loans he gained the title of the "veto governor." His course was sanctioned, however, by the people, as he was re-elected in 1855 and his measures were sustained by the legislature in the following session. He was a delegate to the Charleston convention of 1860 and opposed secession, but later became a colonel in the Confederate army. He commanded a brigade in the Peninsular campaign, and was conspicuous for gallantry at Seven Pines, but his health compelled his retirement from the army soon afterward, and he took no further active part in the War. He was a member of the State constitutional convention in 1865, and in 1866 was elected to the United States Senate, but was refused admission.

Winston, N. C. See WINSTON-SALEM.

Winston-Salem, N. C., twin city, county-seat of Forsyth County; on the Norfolk & W. and the Southern R.R.'s; 115 miles north of Raleigh and 28 miles west of Greensboro. Winston and Salem have independent municipalities, but as they are one commercially and industrially, they are usually called Winston-Salem. The city is the commercial centre of a fertile agricultural region, especially noted for its tobacco. It is a manufacturing city of importance; the tobacco manufacture is the leading industry; there are large tobacco warehouses, and plug and leaf tobacco factories, representing about \$2,000,000 capital invested; other industrial establishments include chemical works (the largest in the South), roller mills, cotton mills, knitting mills, a box factory, machine shops and foundries. The business is mostly concentrated in Winston, while Salem is mainly residential. The streets are broad and well paved, and there is a large park; the city has an electric railway, and two systems of water-works, one under the ownership of the municipal government of Winston. Of the public buildings the court-house in the central square of Winston and the city-hall and armory are the most notable; in 1904 plans were laid out and soon work was begun on the erection of a United States government building. There is an excellent public school system, including a graded school for colored children; and the city is also the seat of the Salem Academy and College, a Moravian school for young women, founded in 1802, the Salem Boys' School (Moravian); and the Slater Industrial and Normal School, a non-sectarian institution for the colored race.

Salem was founded, in 1766, by Moravians as a church community. For a number of years the town was governed by the church in affairs secular as well as religious. The Moravian bishop, Count Zinzendorf (q.v.), made the plans for the city and for the government which existed during the first years. The government of Salem is now administered under the revised charter of 1891; the government of Winston under the charter of 1899, in both cases the mayor is elected every two years. Pop. Winston (1890) 8,018; (1900) 10,006; (1910) 17,167. Pop. Salem (1890) 2,711; (1900) 3,642; (1910) 5,533.

G. R. WIMM,

Sec'y Winston-Salem Chamber of Commerce.

Wint, Peter De. See DE WINT, PETER.

Winter, John Strang. See STANNARD, HENRIETTA.

Winter, William, American author and dramatic critic; b. Gloucester, Mass., 15 July 1836. He was graduated from the Harvard law school in 1857; was admitted to the Suffolk County bar, but never practised; published in 1854 a book of verse, 'The Convent, and Other Poems'; and was for a time a successful lyceum lecturer. From 1860 he was a contributor to the 'Saturday Press' and other New York periodicals; for several years was assistant editor of the 'Albion'; and in 1865 became dramatic reviewer for the *Tribune*, for which he has since continued to write. He was at one time also managing editor of the New York 'Weekly Review'; and he has been a frequent contributor to leading magazines and reviews. In addition to his criticism, he became known also for his biographical studies, and his sketches of travel abroad and historic foreign localities. His prose style is one of considerable distinction, and his verse is finished in character. He wrote further: 'The Queen's Domain and Other Poems' (1858); 'My Witness' (1871), poems; 'Thistle-down' (1878), poems; 'Poems,' complete edition (1881); 'The Jeffersons' (1881); 'English Rambles' (1883); 'Henry Irving' (1885); 'Shakespeare's England' (1886), chapters of travel and historical study; 'Stage Life of Mary Anderson' (1886); 'The Wanderers' (1888); 'Gray Days and Gold' (1891); and 'Old Shrines and Ivy' (1892), essays on England; 'Shadows of the Stage' (1892-3-5); 'The Life and Art of Edwin Booth' (1893); and 'The Life and Art of Joseph Jefferson' (1894). He also edited (1881) the works of Fitz-James O'Brien (q.v.), and 'The Shakespearian and Miscellaneous Plays of Edwin Booth' (1899).

Winter, one of the four seasons, the coldest of the year. Astronomically considered, winter begins in northern latitudes when the sun enters the sign of Capricorn, or at the solstice about 21 December, and ends at the equinox in March; but in its ordinary sense it is taken to include the months of December, January and February.

Winter-berry, several members of the genus *Ilex*, of the holly family, are known by this name, including the inkberry (q.v.). They are all native to eastern North America, but the species commonly indicated by the name is the black alder (*I. verticillata*), an arborescent shrub, common in swampy places and along the banks of streams, often overhanging the water. The acute, oval leaves turn black in autumn, and the axillary cymes of tiny polygamodioecious, whitish flowers, are succeeded by brilliant scarlet berries, that are as large as a pea, and are so crowded on the bare branches as to appear verticillate. They remain on the shrub all winter, and twigs are often sold by city florists for winter decoration. The bark of the winter-berry is tonic and astringent, and in infusion has been employed as a lotion for dressing ulcers.

The smooth winter-berry (*I. laevigata*) is a handsome shrub at all seasons and is similar to the black alder, but has larger stalked drupes, of a more orange tint, less crowded, and ripening earlier.

Winter-cherry, a solanaceous herb (*Physalis alkekengi*) of the south of Europe, cultivated for its ornamental fruit. It is a downy perennial, with semi-decumbent stems and broad deltoid leaves. The axillary, solitary flowers have campanulate five-lobed and whitish corollas. The calyces are also five-toothed and campanulate, but in fruit become inflated so that they are like miniature membranous balloons surrounding a pulpy, globose, cherry-like berry, which is edible, well-flavored, and acidulous, serving chiefly for preserves. These fruit-bladders are of a bright scarlet hue, and glow far into the winter. They will even keep their color for some time when cut. The plants are also known as *alkkekengi*, bladder-herb, strawberry-tomato, etc. The Japanese winter-cherry (*Physalis franchetii*) is very similar, but larger, having branches perhaps two feet high, with vigorous, soft, green foliage. They are profusely hung with bright orange-colored translucent lanterns, three inches in diameter.

Winter Cress. See CRESS.

Winter Flounder. See FLOUNDER.

Winter Wren. See WREN.

Wintergreen, a name applied to several ericaceous plants which retain their foliage over winter. In eastern America, the aromatic little *Gaultheria procumbens* (see GAULTHERIA) is generally the plant referred to by this name. It is a low shrub, barely six inches high, found in rocky woods, with creeping stems, half-hidden, from which arise erect, reddish branches, bearing ovate glossy leathery leaves. These are serrate with bristly tipped teeth and are gathered in a tuft at the top of the slender stalk, the fleshy, white or pinkish, urn-shaped flowers nodding underneath. The fruits are bright scarlet, mealy and spicy in flavor; and are really enlarged fleshy calyces which have enclosed the seed-capsules and assumed the form of a berry. They are sometimes called checker-berries, and remain throughout the winter. The whole plant is aromatic in taste, and is frequently eaten, foliage, berries and all. The spiciness is due to the volatile oil of *Gaultheria* (q.v.) which is a stimulant, astringent, and diuretic drug, but is chiefly used for flavoring, confectionery or pharmaceutical preparations. It is a commercial product distilled from the wintergreen where it is plentiful, or from the sweet-birch (*Betula lenta*). The various members of the genus *Pyrola* are called wintergreen, such as the round-leaved wintergreen, a common plant with a few orbicular, or oval, long-petioled and coriaceous leaves. The flowers are somewhat like those of the lily of the valley, and are fragrant. The spotted wintergreen (*Chamaepitys maculata*) is another plant found in shady woods. It has a decumbent stem, sending up slender branches, which bear a few lanceolate leaves mottled with white, and several white flowers, tinged with purple. The flowering wintergreen is the charming fringed polygala (*Polygala paucifolia*), with a tuft of leaves at the top of the stem, that are not unlike those of *Gaultheria*; but it has a magenta-colored blossom with flaring wings. Still another wintergreen is the chickweed-wintergreen (*Trientalis americana*) a spring blooming herb, with a dainty white, starry blossom, poised above a whorl of foliage like tiny peach leaves.

WINTERHALTER — WINTHROP

Winterhalter, vin'tér-hál-tér, Frans Xavier, German painter: b. Memmenschwand, near Saint Blasien, 20 April 1806; d. Frankfurt-on-the-Main 8 July 1873. He was educated at the academies of Munich and Karlsruhe, and also studied a while in Italy. In 1834 he established himself in Paris, where he obtained the patronage of Louis Philippe, and of many persons of note. In like manner he was liberally patronized by the English court. His productions were principally portraits, with a few fancy pieces and pictures of genre. In France he painted portraits of Louis Philippe and his queen, of all the members of the Orléans family, of Napoleon III. and his empress, and of the prince imperial. He was the favorite court painter in England during the life of the prince consort and executed portraits of the Duke of Wellington, Sir Robert Peel, and other distinguished persons for the queen. His fancy pictures have little other merit than as elegantly composed figure pieces. He finished carefully, and imparted a pleasing and well-bred expression to his faces, with little or no character.

Winter's Bark, the cortex of an evergreen magnoliaceous shrub (*Drimys winteri*) of the mountains of South America. In commerce this bark is quilled or curved, gray outside, brown internally. It has a peculiar aromatic odor, a very pungent and astringent taste, and serves as a tonic, stimulant and anti-scorbutic drug. Paratado bark is a variety of winter's bark. There are many substitutes for the drug, and much of the winter's bark of commerce is obtained from the West Indian *Cinnamodendron corticosum* and *Canella alba*.

Winter's Tale, A, a comedy by Shakespeare based on Greene's 'Pandosto' (1588), later known as the 'Historie of Dorastus and Fawnia.' Forman's Diary gives the date of the production of 'Winter's Tale' as 1611 and the play was included in the First Folio of Shakespeare 1623. In Greene's story, as in Shakespeare's, Bohemia is made a maritime country, and Dolphos an island. The name 'Winter's Tale' is derived partly from the fact that the play opens in winter, and partly from the resemblance of the story to a marvelous tale told by a winter's fire.

Win'terast, Iowa, city, county-seat of Madison County; on the Chicago, Rock Island & Pacific Railroad; about 45 miles southwest of Des Moines. It is in an agricultural region in which the chief products are wheat, corn, and hay. In the vicinity are large stone quarries. It has flour mill, creameries, machine shop, and coal and stock yards. It has an extensive trade in farm and dairy products. The four banks have a combined capital of \$125,000. There are 10 churches, public and private schools, and a public library, founded in 1891. Pop. (1910) 2,818.

Winther, vin'tér, Rasmus Villads Christian Ferdinand, Danish poet: b. Fensmark, Zealand, Denmark, 29 July 1796; d. Paris 30 Dec. 1876. He was educated at the University of Copenhagen and became immediately popular on the appearance in 1828 of his first volume of poems. He was one of the truest interpreters of the Danish national character. Some of his numerous publications are: 'Sang og Sagn' (Song and Legend) (1841); 'Lyriske

Digte' (Lyrical Poems) (1849); 'Nye Digte' (New Poems) (1850); 'Hjortens Flugt' (The Flight of the Hart) (1856), a lyric romance of the Danish Middle Ages, his greatest work.

Winthrop, win'thróp, Fitz-John, American colonial governor, son of John Winthrop (1606-76) (q.v.): b. Ipswich, Mass., 14 March 1638; d. Boston, Mass., 27 Nov. 1707. He studied at Harvard and afterward in England, where he served in the army of the Protectorate until the Restoration. Returning to Connecticut in 1663 he was elected to the Assembly in 1671, served as major in King Philip's War and in 1686 as a member of the council of Governor Andros. He was a magistrate in 1689, major-general commanding the expedition against Quebec in 1690, Connecticut agent at London 1693-7, and governor of Connecticut from 1698 till his death.

Winthrop, James, American jurist, son of John Winthrop (1714-79) (q.v.): b. Cambridge, Mass., 1752; d. there 26 Sept. 1821. He was graduated from Harvard in 1769, was librarian there 1772-87, and for several years was chief justice of the Massachusetts court of common pleas, and register of probate. He published 'An Attempt to Translate the Prophetic Part of the Apocalypse into Familiar Language' (1794); 'Systematic Arrangement of Prophecies relating to Antichrist' (1795); etc. His library was bequeathed to Allegheny College, Meadville, Pa.

Winthrop, John, American colonial governor: b. Edwardston, near Groton, Suffolk, England, 12 Jan. 1588; d. Boston, Mass., 26 March 1649. He studied at Trinity College, Cambridge, was bred to the law, and, according to the testimony of Cotton Mather, was commissioned at 18 a justice of the peace. His earlier years were spent on his estate of Groton Manor, but his Puritan tendencies and the current of his political sympathies presently interested him in plans for colonization in America. When in 1629 a charter was obtained creating a corporation under the name of the 'Governor and Company of the Massachusetts Bay in New England,' the piety, learning, and talents of Winthrop led to his election as governor. Converting his hereditary estate, yielding an annual income of £600 or £700, into money, he set sail in the *Arabella* from Yarmouth 7 April 1630, with a company of about 900 persons. On the voyage he composed a small treatise, entitled 'A Model of Christian Charity.' On 12 June they arrived at Salem, Mass., and the government was immediately transferred to him by Endicott, who had been the acting governor for two years by authority of the London company, before the transfer of the charter to New England. He was re-elected every year until 1634, when his popularity had somewhat declined, partly on account of his long continuance in office. In 1636, when Sir Henry Vane was elected governor, Winthrop was chosen deputy governor, and during this and the following year occurred the celebrated controversy in regard to Mrs. Hutchinson and her doctrines. In this matter Vane and Winthrop were on opposite sides, and in the election of 1637 the latter was chosen governor over Vane. The inhabitants of Boston, however, were friendly to Vane and Mrs. Hutchinson, and Winthrop was at first slighted by his neighbors. Subsequently he engaged in a controversy with his defeated

WINTHROP

opponent in regard to the alien law passed by the general court. He was re-elected every year until 1640; and in 1642 the troubled state of the colony induced the settlers to call him again to the head of the government. He was again elected in 1643, in the two following years was made deputy governor, and in 1646 governor again, which office he continued to hold the remainder of his life. In his principles Winthrop was opposed to an unlimited democracy, and when the people of Connecticut were forming a government, he wrote them a letter in which he said that "the best part of a community is always the least, and of that best part the wisest part is always the lesser." But he was attached to civil liberty, disinterested, pure, and conscientious. "It would be erroneous," says Palfrey, in speaking of the commonwealth of Massachusetts, "to pretend that the principles upon which it was established were an original conception of Winthrop's mind; but undoubtedly it was his policy, more than any other man's, that organized into shape, animated with practical vigor, and prepared for permanency, those primeval sentiments and institutions that have directed the course of thought and action in New England in later times." Winthrop kept a journal containing an account of the transactions in the colony down to the year 1649. The first two books were first published in 1790, and the manuscript of the third, which was for a long time lost, was found in 1816 in the tower of the Old South Church. The three were published in a revised edition entitled 'The History of New England from 1630 to 1649,' with notes by James Savage (1825-6). Consult 'Collections of the Massachusetts Historical Society,' 3d series, Vols. 9 and 10; R. C. Winthrop, 'Life and Letters of John Winthrop' (1864); Whitmore, 'Notes on the Winthrop Family and its English Connections' (1864); Twitchell, 'John Winthrop' (1891); Earle, 'Margaret Winthrop' (1895).

Winthrop, John, American colonial governor, son of Governor John Winthrop, of the Massachusetts Bay Colony. b. Groton Manor, Suffolk, England, 12 Feb. 1606, d. Boston, Mass., 5 April 1676. He was educated at Bury Saint Edmund's Grammar School, at Trinity College, Dublin, and at the Inner Temple, London, where he studied law. He obtained a commission in the army, and served with Buckingham in the expedition for the relief of the Huguenots near La Rochelle, France, in 1627, went in the following year to Turkey as an attaché of the British embassy, traveled in various countries of Europe, in 1631 joined his father in Massachusetts, where he became governor's assistant, and in 1633 settled at Ipswich, of which he was one of the principal founders. Obtaining a commission under a grant to the Earl of Warwick, he founded Saybrook, at the mouth of the Connecticut River, in 1635, built there a fort, and was made titular governor. In 1645 he removed his family from Boston to Pequot Harbor, and in the following year founded New London. After the union of Saybrook with Connecticut he became a magistrate of the increased colony (1651), and from 1657 to the end of his life served almost continuously as its governor. He was bearer to Charles II. (1662) of a loyal address from the Connecticut government, and received from the king a suitable charter for the

colony. Under an equally favorable charter he secured the union of the Connecticut and New Haven colonies. He was one of the commissioners of the United Colonies of New England in 1675. A student of physics and chemistry, through his scientific attainments he became a member of the Royal Society, to whose 'Transactions' he was a contributor.

Winthrop, John, American physicist, great-grandson of John Winthrop (1588-1649) (q.v.): b. Boston 19 Dec. 1714; d. Cambridge, Mass., 3 May 1779. He was graduated from Harvard in 1732 and from 1738 until his death was Hollis professor of mathematics and philosophy there. He was one of the most important American scientists of the 18th century and exercised much influence upon the scientific thought of his contemporaries, in particular upon Franklin and Count Rumford (q.v.). He noted the transits of Mercury in 1740 and 1761, going to Newfoundland in the latter year for this purpose in a vessel supplied for the purpose by the Massachusetts Province. He twice declined the presidency of Harvard, was for some years a judge of probate for Middlesex County, and was a member of the governor's council 1773-4. He was a prominent advocate of political liberty. He published 'Lecture on Earthquakes' (1755), and is sometimes claimed as the founder of the science of seismology. He published: 'Answer to Mr. Prince's Letters on Earthquakes' (1756); 'Account of Some Fiery Meteors' (1755); 'Two Letters on the Parallax and Distance of the Sun as deducible from the Transit of Venus' (1769); etc.

Winthrop, Robert Charles, American political leader: b. Boston, Mass., 12 May 1809; d. there 16 Nov. 1894. He was graduated from Harvard in 1828, studied law with Daniel Webster, and was admitted to the bar in 1831. He soon became active in political life, allying himself with the Whig party, and in 1834 was elected to the Massachusetts legislature, where he served five years, being speaker of the House for three years. In 1840-50 he was a member of Congress, and in 1847-9 speaker of the House of Representatives. In 1850, on Webster's resignation from the Senate, Winthrop was appointed his successor for the unexpired term, but in 1851 failed to secure election to the Senate. In 1851, as Whig candidate for governor, he received a plurality of votes, but the constitution at that time required an absolute majority for election; the election, therefore, went to the legislature, where he was defeated. During his term in Congress he had shown himself a conservative, and, though opposed to the extension of slavery, and to the Mexican War, he had no sympathy with the extreme abolitionists, and desired compromise between North and South. His defeat was due, therefore, to a coalition between the Free-Soilers and the Democrats in the Massachusetts legislature. After the Whig party dissolved, he took no prominent part in political work, he did not join the Republican party, but occasionally spoke in behalf of the Democrats, though not actively affiliated with them. He made frequent public addresses on various national anniversaries and occasions, being the chief speaker at the laying of the cornerstone of the Washington Monument in 1848, and on the completion of the work in 1885. He was

WINTHROP—WIRE AND WIRE DRAWING

president of the Massachusetts Historical Association for 30 years, and had a leading part in the organization and direction of the Peabody Educational Fund (q.v.). He wrote 'Life and Letters of John Winthrop' (1864); 'Washington, Bowdoin, and Franklin' (1876); 'Memoir of Henry Clay' (1880).

Winthrop, Theodore, American soldier and novelist; b. New Haven, Conn., 22 Sept. 1828; d. Big Bethel, Va., 10 June 1861. He was graduated at Yale in 1848; traveled extensively in Central and South America; studied law at Saint Louis, was admitted to the New York bar in 1855, and joined the 7th New York regiment in 1861. The 'Atlantic Monthly' from June to September of that year contained sketches by him of early war scenes. He was killed at the head of an assaulting column of Northern troops at Big Bethel. He left completed material for five volumes of novels and essays: 'Cecil Dreeme' (1861); 'John Brent' (1862); 'Edwin Brothertoft' (1862); 'The Canoe and Saddle' (1862); and 'Life in the Open Air, and Other Papers' (1863). His sister published 'Life and Poems of Theodore Winthrop' (1884).

Winthrop, Maine, town in Kennebec County; on the Maine Central railroad; 30 miles northeast of Lewiston and 10 miles west of Augusta. It has oil-cloth factories, woolen mills, agricultural implement works, a corn cannery, and a grist mill. There are six churches, a high school, and graded elementary schools. It has a state bank. The oil-cloth industry was begun in Maine, in 1845, by C. M. Bailey of Winthrop. Pop. (1910) 2,114.

Winthrop, Mass., town in Suffolk County; on Massachusetts Bay and on the Boston, Revere Beach & Lynn railroad; about five miles northeast of Boston. It is a popular beach resort, and a favorite residential section for Boston. The town was originally a part of Boston, then of Chelsea, and later of North Chelsea. In 1852 it was set off and incorporated. It contains many features of historic interest, chief of which is the Dean Winthrop house, built in 1649. It has also Forts Heath and Banks, the Winthrop Shore Reservation, the Ingalls Park, and the Frost Public Library. Pop. (1890) 2,726; (1900) 6,058; (1910) 10,132.

Wintun ("people," "Indians"), a group of tribes, which, with the Patwin group form the Copehan linguistic stock of North American Indians. The habitat of the stock is northern California from Mount Shasta, including the headwaters of the Sacramento and the valley of McCloud River; thence southeastward along the Sacramento Valley to the mouth of Chico Creek, from which point to its mouth the Sacramento forms the southeastern boundary. On the west the Coast range intersects the territory of the Copehan stock, the westernmost limit of which extends almost to the south branch of Trinity River, about lat. 40° 30' N. From the latitude of Cape Mendocino the Coast range forms the western boundary as far as John's Peak, whence it extends in an irregular line southeastwardly to San Pablo Bay. The tribesmen live largely by fishing, although various roots, nuts, berries, farinaceous seeds, and clover blossoms form part of their subsistence. They are fond of the water and are constant

bathers in the streams that drain their country. Salmon are caught with spears, in the use of which they were exceedingly expert. Their weapons were formerly bows and arrows, and slings. They were indifferent hunters, but were successful in ensnaring deer in traps of their own construction. The population of the score or more of tribes forming the stock is not known, only the Nomlaki and the Wailaki being officially recognized. These are under the Round Valley Agency and are small in number.

Wire and Wire Drawing. Wire is defined as metal elongated into threads or small rods, of thicknesses varying from about half an inch to even less than $\frac{1}{16}$ of an inch, but intended for each size to be uniform throughout the piece, these threads or rods having usually the cylindrical form, and being commonly produced by the process known as wire drawing. Essentially, this process consists in drawing or pulling a suitably prepared piece of the metal thus worked through a series of holes made in a hardened steel plate, called a draw-plate, and which successively diminish in diameter. In this way the cross section of the wire is gradually reduced to that of the last hole through which it is passed; its length, meanwhile, being correspondingly and greatly increased. As a consequence, wire can be produced only from such metals as are susceptible in this way of being pulled out or extended by stretching into rods. Such metals are said to be drawable, or to have the property of ductility. This property is not to be confounded with that of malleability, namely, that in virtue of which a metal is laminable, or admits of being hammered or rolled into thin plates; since the same metal is often malleable and ductile in very different degrees. Thus, while gold possesses both these properties in an extreme, and probably in the highest known degree, iron is ductile in a degree far beyond that in which it is malleable, and with tin and lead the reverse is true. Of the familiarly known metals, the most ductile, and in the order named, are gold, platinum, silver, copper, steel, iron, brass, zinc, lead, and tin; while aluminum, and some of the ordinarily brittle metals when made perfectly pure, as bismuth, are said to possess very high ductility. In early times metals were brought to the filamentous form only by means of beating them under the hammer into thin plates, then dividing these by cutting instruments into narrow strips, and rounding finally with the hammer and file. The earliest known mention of "wire drawers" and "wire millers," as those who produced wire by drawing were variously called, occurs in 1351 and 1360, in the histories respectively of Augsburg and Nuremberg, the previous accounts being only of "wire smiths," or those who fabricated wire with the hammer. The change from the old to the new method was accomplished, or very soon followed, by the introduction of a machine by which wire was successfully produced without direct aid of the hand; this machine, probably the invention of one Rudolf, of Nuremberg, was impelled by water power. The precious metals appear to have been the first subjected to this process—brass and iron not until some time later. White wire, or blanch iron wire, is mentioned in a list of articles not to be imported into England in 1463; and in 1484 both iron and latten (fine brass) wire are

WIRE CLOTH—WIRE GLASS

similarly named. Up to 1565 English iron wire was drawn by hand only, and was of so poor a quality that most of that used in the country, and also wool cards and other articles involving the employment of wire, were imported; and that in the year named patents were granted to manufacture wire in England.

The modern system of wire drawing is described under **WIRE, MANUFACTURE OF**.

In 1903 there were 29 wire mills in the United States giving employment to 10,000 persons. The amount of capital invested was \$4,242,173, and the total value of product was \$9,421,238. In the same year there were 597 wire working establishments, having an output valued at \$19,942,882. See **STEEL MANUFACTURE**.

Wire Cloth, a sieve-like fabric whose woof and weft are of wire; the size of the wire, the shape and sizes of the meshes, being adapted to the uses of the completed screen, sifter, or sieve, or the character of the machine in which it is to be used.

Wire Gauge, an instrument or mechanism for measuring the thickness of wire and sheet metals. It is usually a plate of steel having a series of apertures around its edge, each corresponding in width to the diameter of wire of a certain number.

Wire Glass, a modern invention used in building construction, being a combination of wire and glass. Wire glass is either ribbed,

fractured, but it will retain its place, and the perils incident to falling glass and the ingress or egress of draft and flame are avoided. Wire glass appeals to both the practical and the æsthetic in architecture. Practically it supplies the requisite light and ventilation as well as protection against fire, while it admits of a considerable saving in space, weight and cost. Æsthetically it is admissible to all window openings, because it obviates the necessity of cumbersome and unsightly hinged shutters, and the projecting lugs and adjusters which support and secure them. Metal sashes fitted with wire glass are rustless, water-proof, durable, sanitary, noiseless in operation and as workable as ordinary window sashes.

The first attempts to introduce a metallic mesh into the body of the glass were for the purpose of increasing its strength and to prevent its falling apart when broken. In this respect the product has been thoroughly developed, but in addition it has proved to be one of the most remarkable fire retardants available for building purposes, and in view of the exceptional hazard attaching to window and skylight openings in all buildings, its uses as a fire retardant is outranking in importance as well as quantity, its other values. Many experiments have been made to develop different processes of manufacturing wire glass, but, owing to the inherent difficulties of maintaining the homogeneous quality of the glass, preventing damage from excessive heat to the wire and securing a practically central location of the wire in the body of the glass, only two methods have proved effective. One of these, known as the Shuman process, from the name of its inventor, Frank Shuman, of Philadelphia, consists of rolling a sheet of glass, laying the wire mesh upon the body of the glass, pressing the same into the glass instantly and while still plastic, and by a coincident process, smoothing over the slight abrasions made in the surface of the glass so as to secure a true and smooth surface on both sides of the glass. The other process known as the Appert process, from its inventor, Leon Appert, of France, involves the rolling of one sheet of glass, laying of the wire mesh upon this sheet and immediately and by a simultaneous and continuous process pouring and rolling a second sheet upon the top of the wire so as to completely imbed it and secure at the same time an absolutely solid single sheet of finished glass. Wire glass is now made in all the varieties known to the rolled glass process, including rough or hammered glass; ribbed glass, figured glass. Wire glass is also polished like plate glass, giving an entirely clear and transparent glass, and is largely used in fire-proof office buildings where there is any external exposure to fire.

The mechanical strength of plate glass is effectively increased by the introduction of the wire mesh, so that it will submit to much greater strains, and in fact one of its first purposes and effects was to eliminate the necessity for using in skylights one half inch glass, it having been proved that by using one quarter inch wire glass all the requirements were met, the breakage risk decreased and a very large factor of weight and expense in structural material eliminated.

WILLIAM DULLES, JR.,
Vice-Pres. Mississippi Wire Glass Co.

Wire Glass Fire-Proof Window.

rough rolled, polished plate or "maze," having wire netting imbedded in its centre during the process of manufacture. The temperature at which the wire is imbedded in the molten glass insures cohesion between the metallic netting and the glass, and the two materials become as one, so that if the glass is broken by shock, by intense heat or from other cause it remains practically intact. It combines the strength of the wire netting and the glass plate, and the wire is so thoroughly covered as to obviate the possibility of rust or corrosion. Wire glass will break, but it will not scatter. It can be

WIRE, MANUFACTURE

Wire, Manufacture of. At the present time all wire is made by the drawing process, and while permitting the production of a much thinner wire than could be obtained from the rolls, it also gives a wire of greater tensile strength, so much so that the smaller the size to which the wire is drawn down, the greater is its ultimate breaking strength. The wonderful strength of piano wire is well known. The breaking strength of English piano wire ranges from 225 pounds for No. 12 music wire, which is 0.029 inch in diameter, to 650 pounds for No. 22, which is 0.052 inch in diameter, indicating an ultimate tensile strength, ranging from 300,000 to 240,000 pounds per square inch. This wire is composed of carbon, 0.570; silicon, 0.090, sulphur, 0.011; phosphorus, 0.018; and manganese, 0.425.

In the past, all classes of iron wire were made entirely from wrought iron, and required very careful preparation of the raw material to insure toughness and high tensile strength; but, with the discovery of the Bessemer and the open-hearth converting processes, and the consequent lowering of the cost of production accompanied by an enormous increase in the strength of the raw material, wrought iron was quickly supplanted by steel. The great increase in the strength of steel wire over that of wrought iron may be better appreciated from the following statement of facts. The ultimate strength of the best bright hard-drawn wrought-iron wire is about 35 tons to the square inch, while that of ordinary Bessemer steel is 40 tons, and that of open-hearth steel is 60 tons to the square inch. In the special grades of wire manufactured from high carbon, open-hearth steel and from the best cast steel, the values range from 100 to 170 tons per square inch.

A description of the process of manufacture may be commenced with the billets. The bulk of the wire of commerce is made from Bessemer steel billets, while open-hearth billets are worked up into rods for the manufacture of chain, for special grades of wire, and for various finished products requiring great tensile strength. The billets are generally stored near the continuous heating furnaces located at the upper end of the rod mill. In the larger plants, when the mill is in full operation, four furnaces are continually at work, with a fifth held in reserve. The billets, which are 4 x 4 inches in section, and 36 inches in length, are fed into the furnace transversely, side by side, and are pushed through the furnace door by a hydraulic charging machine. After they have been heated to the right temperature for rolling, they are pushed out, one after the other, through the rear door of the furnace onto a conveyor which takes them to the rod mill, where they are passed through the roughing rolls. This mill consists of eight pairs of rolls, and by its operation reduces the billet from its section of 4 x 4 inches to a rod $\frac{3}{4}$ of an inch square and of great ultimate tensile strength. Each pair of rolls is placed at an increased distance from the one preceding, so as to allow for the increase in the length of the rod due to the decrease of the sectional area of the billet, and the alternate pairs of rolls are provided with different shaped grooves so as to press the rods into shapes alternately square and oval, oval and round, etc., thus working the metal thoroughly

and improving its qualities. In the eighth pair of rolls the grooves are $\frac{1}{4}$ of an inch square, and from them the rods are carried to the finishing mill where they are given ten more passes and brought down to the required dimensions.

The finishing mill lies at right angles to the roughing mill with its ten pairs of roll arranged side by side. As the rods issue from one pair of rolls, they are seized with a pair of tongs by workmen who bend them around and feed them into the next pair. The rapid increase in length is accommodated by the increased speed of the successive pairs of rolls, that of the tenth pair being about 1,350 feet per minute, or about 15 miles per hour. The entire operation of rolling down the billet to a finished rod $\frac{3}{4}$ inch square and about a quarter of a mile long, is accomplished in one heat. As the rods issue from the last pair of rolls, their ends are seized and attached to the drums of the Garret reels on which they are wound up into coils of convenient size, and then dropped onto a conveyor by which they are carried to the wire mill.

In the wire mill, the coils are thoroughly cleaned of scales, oil, and dirt by being placed in wooden tanks containing a weak solution of sulphuric acid. They are then taken out and hung up on a circular track, where they are allowed to remain long enough to oxidize slightly on the surface in order to permit a good grip upon the wire in the process of drawing. Further oxidation is prevented by placing them in a solution of lime, and then they are placed in the bakeries and dried out thoroughly. Up to this point the product is technically known as "rods," and only after it has been drawn down is it known under the commercial designation of "wire."

The wire drawing machine consists of a stout bench upon which is mounted a cast-iron drum, around which the wire is wound as it is drawn through the dies. The die-plates are heavy blocks of cast-steel, perforated with tapering holes exactly gauged to the desired size of the wire. In drawing, the coil of wire is placed on a spool fastened to the floor of the shop near the end of the bench, and the end of the wire having been swaged down, it is inserted in the larger end of the hole in the die-plate, passed through, and attached to the drum and wound up until the entire coil has been drawn down. Since the wire is drawn cold, the consequent strains are removed by placing the coils in the annealing pots, where they are carefully sealed with sand to exclude the air, and are then exposed to a steady heat for a period of eight or nine hours. Of the total finished product taken out of the annealing pots, a portion is ready for the market without any further treatment; a portion is galvanized; but the most of it is converted into wire nails and barbed wire. See NAILS, MANUFACTURE OF.

Barbed wire is manufactured in various patterns. The general process may be outlined by a brief description of the machine employed in making what is known as a-point Glidden barbed wire. Four coils of wire on reels are placed behind the machine. The wire from two of the reels serves to form the strands, while that from the other two is used to form the barbs. The two strand wires, which are larger than the other two, are led between a

WIRE NAILS—WIRE ROPE

pair of friction wheels and pulled to a proper tension, and then crossed by the other two transversely, one on each side. At fixed intervals of a few inches, according to the desired spacing of the barbs, the two barb wires are caught by a pair of revolving fingers and twisted around one of the strand wires, and at the conclusion of the twist, two pairs of shears cut the ends of the barbs diagonally into sharp points. The wires then pass into a combined winding and twisting machine by which the two strand wires are twisted around each other, and then to the spool where it is wound up ready for the market. When once started, the operation of wire making is continuous and rapid, and the larger plants are capable of producing as much as 150 tons of barbed wire per day, while the total output of wire from the mills in the United States amounts to about 2,000,000 tons per year, of which about 500,000 tons are converted into wire nails. See also STEEL MANUFACTURE.

W. MOREY, JR.,
Consulting Civil Engineer.

Wire Nails. See NAILS.

Wire Rope, a variety of ropes of iron or steel wire extensively employed in raising and lowering apparatus in coal mines, as standing rigging for ships, as substitutes for chains in suspension bridges, and for telegraph cables. Endless wire ropes or cables are also used on traction railways, and in transmitting power over long distances where ordinary belting would prove unsuitable. Wire ropes were used in 1822 for a suspension bridge at Geneva, and for a similar structure of great span at Freiburg in 1835. A variety of machines are in use for making wire rope. The relative values of round ropes of iron, steel, and hemp are here tabulated:

Hemp		Iron		Steel		Breaking Strain
Diameter in inches	Weight per foot lbs.	Diameter in inches	Weight per foot lbs.	Diameter in inches	Weight per foot lbs.	
1 1/4	1.16	1 1/4	.75	1 1/4	.39	8
1 1/2	2.00	1 1/2	1.40	1 1/2	.63	14
1 3/4	2.66	1 3/4	1.80	1 3/4	.89	18
2	3.16	2	2.45	2	1.20	26
2 1/4	5.66	2 1/4	4.15	2 1/4	2.00	40

Dimensions and Durability.—In the United States the wire rope generally in use is composed of a hemp centre around which are laid six strands of 7, 9, 12, or 19 wires, thus forming a rope of either 42, 54, 72, or 114 wires. Ropes with seven wires are generally used for standing ropes, guys, transmission of power, etc. Ropes with nine wires are generally used for haulage ropes in mines, on inclines and for transmission of power. Those with 12 wires to the strand are generally used for ship-rigging and 19 wires for hoisting. Wire rope is as pliable as hemp rope of equal strength and therefore can be operated over sheaves and drums of the same size and is far more durable and efficient. Durability of wire rope depends principally upon the diameter of the sheaves or drums; the greater the size of the

sheaves or drums, the longer the rope will last. Experience has demonstrated that the wear increases with the speed. It is therefore better to increase the load than the speed. One fifth of the ultimate strength of rope is considered a fair working load. Wire rope must not be coiled or uncoiled like a hemp rope. When not on a reel, roll on the ground like a wheel or hoop to prevent twisting or untwisting. Galvanized rope should never be used for running rope. To preserve wire rope under water or under ground, add one bushel of fresh slacked lime to a barrel of mineral or pine tar—boil and apply hot. On incline planes the grooves of the pulleys or idlers should be lined with wood or babbit metal. It is recommended to use as few idlers as possible. In a great many cases, they do more harm than good. For transmission of power the sheaves should be lined with leather or India rubber, to secure increased adhesion and prevent wear. The use of cast-steel rope is becoming general because of its lightness, greater strength and durability. To get the best results, steel rope should be made of the best quality of crucible cast steel. Ropes made from low grades of steel are inferior to iron ropes. The use of Bessemer steel in running ropes is not advisable. Ropes should be examined frequently and a new rope ordered before the old one is allowed to wear out. Attention to this will insure safety and prevent serious accidents.

Galvanized Steel Cables are largely used for suspension bridges and are composed of six strands with wire centre.

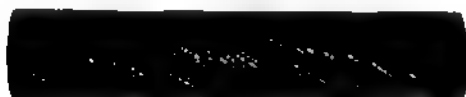
Diameter in.	Approximate circumference in.	Weight in pounds per foot	Approximate breaking strain in tons of 2,000 lbs.
2 3/4	8 1/4	12.7	310
2 1/2	7 1/4	11.6	283
2 1/4	7 1/4	10.5	256
2 1/2	7 1/4	9.50	232
2 1/4	7 1/4	8.52	208
2 1/2	6 3/4	7.60	185
2	6 1/4	6.73	164
1 3/4	5 3/4	5.90	144
1 1/2	5 1/4	5.10	124
1 1/4	5	4.34	106
1 1/2	4 3/4	3.90	90
1 1/4	4 1/4	3.10	75
1 1/2	4	2.57	62

Galvanized Steel Hawseers are usually 37 wires to the strand and combine great strength with pliability. The demand for towing a number of heavy loaded barges, practically in all kinds of weather, has called for a wire hawser stronger than any Manila hawser made. The two grades presented in the table—Cast-steel and Special—are made with a hemp centre and six strands of 37 wires each.

Approximate Diameter in.	Circumference in.	Weight per foot lbs.	Approximate breaking strain in tons of 2,000 lbs.	
			Cast-steel	Special
2	6 1/4	6.25	128	166
1 3/4	5 1/4	4.85	101	131
1 1/2	5	4.00	84	109
1 1/4	4 3/4	3.60	76	99
1 1/2	4 1/4	3.90	62	81
1 1/4	4	3.55	55	72
1 1/2	3 3/4	1.95	42	55
1	3	1.44	31	40

WIRE ROPE

Flattened Strand Ropes.—Instead of being made up of strands of circular form in cross-section, flattened strand ropes are constructed with strands, each of which has one or more flattened surfaces, so that one flattened surface is exposed on the outside of the full length of rope, with the result that a plurality of wires in each strand must at all times take the wear instead of there being only one external wire in peripheral working in each strand, as is the case with ropes of ordinary construction while new. Until the wear has greatly advanced and consequently a considerable diminution of strength has taken place in an ordinary rope, the friction is borne in a very marked manner upon the crown of the one wire nearest the periphery of the rope in each strand, and in cases where small wire is used it is rapidly worn through, while heavier wire has a tendency to fracture where the abrasion has taken place. Owing to the number of wires that are at all times exposed to wear in a flattened strand rope for a considerable distance along their respective lengths, a smooth or comparatively smooth surface is presented even while new, and the wear is consequently light upon any individual wire and the tendency to become brittle is minimized. These ropes are exceedingly flexible and are less liable to the crushing action which frequently takes place in other ropes. They are made up with the wires in the strands and the strands in the rope laid in the same direction or reversely. Owing to the comparatively little wear which takes place in these ropes, so large a margin between working load and breaking strain is not required as in ropes of ordinary construction. Flattened strand ropes are free from all tendency to spin or kink and a considerable saving in wear of pulleys and sheaves is effected by their smooth surface which is shown in the two following illustrations:



New.



Worn.

The end sections show a comparison of structure and wearing surface of round and flattened strand rope.

Hercules Wire Rope.—This is a very high grade of rope, the steel for which is specially prepared for it under a patent process and then

the wire tempered and drawn by a patent process, producing a steel strong and tough and that is uniform in density, texture, elasticity, elongation and strength, every wire being carefully tested for these points and the tests registered for reference. It is a rope that was evolved originally for use in extra hazardous places and where there is liability for rough usage.

Aerial Wire Rope Tramways.—Aerial tramways may be used to advantage both in operation and construction for transporting material from one place to another. This is especially true with ores, coal, stone, lime, rock, gravel, earth, sand, and cord wood. Packages, lumber, logs, light merchandise and water may also be transported economically. Usually the material is loaded on the cars at one terminal or an intermediate loading station and carried to the opposite terminal where it is discharged. By means of various devices it can be arranged for the discharging of the material at any point along the line for use in such work as constructing dams, carrying refuse from plants, etc. Aerial trams can be constructed in a hilly country without the necessity of making tunnels, cuts, embankments or bridges as compared to railway construction. Rivers and ravines are spanned while hills and other constructions are overcome by building the line directly over them and supporting it by towers or derricks at these points. Grades are no barrier to this construction as they can be built to surmount practically any grade and in fact where the loads are carried down grade and the grade is sufficient the entire tramway will be self-propelled, due to the forces of gravity. An aerial tramway is free from surface traffic, so that the underlying ground may be used for other purposes. Tramways are not affected by the elements, such as snow, sleet, rain or frost and may be operated irrespective of the weather.

There are two distinct classes of aerial tramways; namely, single rope systems and double rope systems. The single rope system is the simpler in construction of the two and for limited capacity not exceeding eight tons per hour, an average condition of route is economical in both construction and operation. This system consists of a moving endless rope to which are attached in various manners the carriers or buckets. The entire line is supported by sheaves placed on towers which are located dependent upon the profile of the ground. At each terminal the cable passes around a sheave or series of sheaves, generally one of them being provided with grips in its periphery for driving or controlling the tramway. When divisible material is carried, mechanical loaders are used and the buckets are arranged so that they discharge automatically. This is all accomplished while the line continues in operation. Bulky material can be loaded and taken away from the carriers while the tramway continues in motion, owing to its slow speed. The double rope system is always preferable to a single system owing to the fact that a separate track rope is used upon which the buckets travel instead of one cable performing the work of both supporting and propelling. This diminishes and divides the strains developed thereby, greatly increasing the life of the cable and plant. The double rope system will fulfil almost any requirements in the

WIRELESS TELEGRAPHY — WISCONSIN

tramway line and may be built practically any length. The practicability of long lengths of tramway is fully demonstrated by the tramway built for the North American Copper Company at Encampment, Wyo., which has a total length of over 16 miles and is built in four sections, making it the longest tramway in this country. The double rope system is capable of carrying capacities as great as 200 tons per hour and in fact even greater, when conditions demand it. The double rope system in general consists of two tracks or standing cables, upon which the loaded and empty carriers travel respectively and an endless traction rope for propelling them. The track cables are stretched at high tension, one end being anchored solidly and the other being fastened to a tension device. All of the cables are supported by towers, which are located according to the shape of the ground over which the line passes.

In all of the above classes, the traction rope passes around a sheave or a series of sheaves at either terminal; one, however, being generally provided with grips in its periphery for clamping the cable in order to secure the necessary friction for driving or controlling the tramway. In long lines, tension stations are provided for dividing the tension and take up on the track ropes. Double rope systems may be sub-divided into three classes. One in which the carriers are attached and detached to and from the traction rope by means of a friction or compressing grip. The second in which the carriers are permanent fixtures to the traction cable, the loading of same being effected by mechanical loaders while the buckets are automatically tripped at the discharging point. And the third in which the traction cable has permanent fixtures attached to it in the shape of clips or buckets. The buckets in this system are automatically attached and detached to and from same at either terminal of the line by means of a locking device. This latter system is furthermore designed so that the buckets are automatically discharged at the unloading end without any attendants to look after same. A simple tramway which is known as a two-bucket tramway may sometimes be used to advantage where the grade is steep and where the capacity is moderate. This is true for short lines. It consists of two cables stretched parallel to each other, upon each being operated a bucket, the two buckets connected to a traction rope which passes around a sheave or series of sheaves at the upper end of the line. When the loaded bucket descends by gravity, it pulls up the empty bucket on the opposite cable and vice versa. This type is sometimes used on level ground or even up-grade simply by applying power to the line for operating. The most suitable system of tramways to be used in any case depends upon the profile of ground, capacity, nature of material to be transported and terminal requirements and should be investigated thoroughly before deciding upon any particular construction.

Wireless Telegraphy. See TELEGRAPHY, WIRELESS.

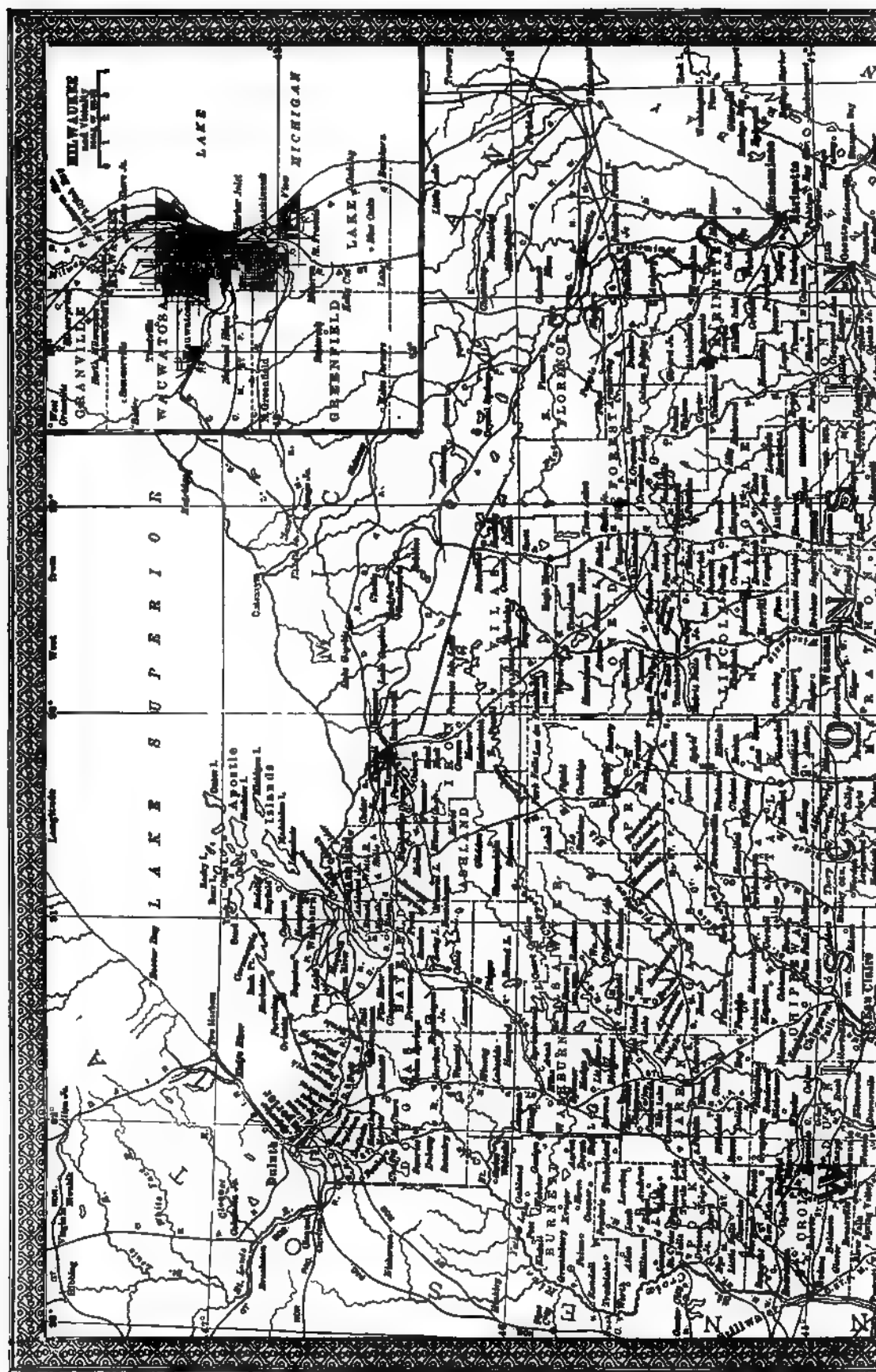
Wireless Telephony. See TELEPHONY, WIRELESS.

Wirt, wert, William, American jurist and statesman: b. Bladensburg, Md., 8 Nov. 1772; d.

Washington, D. C., 18 Feb. 1834. He received a grammar school education, became a private tutor, studied law, was admitted to the bar in 1792, and commenced practice at Culpeper Court House, Va. In 1799 he removed to Richmond, was elected clerk of the house of delegates, and in 1802 received from the legislature the appointment of chancellor of the eastern shore of Virginia. In 1803 he published in the 'Richmond Argus' his 'Letters of a British Spy,' purporting to be papers left at an inn by an English member of Parliament traveling in Virginia. They consist principally of sketches of prominent public orators, with remarks on eloquence and some pages of local description, and proved extremely popular. A second series appeared in the following year in the 'Richmond Enquirer' under the title of 'The Rainbow.' Wirt was an assistant in the prosecution of Aaron Burr and in the course of the trial displayed a learning and eloquence which established his reputation as one of the foremost lawyers in the country. A series of papers somewhat in the style of the 'Spectator,' begun by him and several of his friends in 1810 under the title of 'The Old Bachelor,' appeared in 33 numbers of the 'Richmond Enquirer,' and afterward in book form. His 'Sketches of the Life and Character of Patrick Henry' appeared in 1817, and became immediately popular. In 1816 Wirt was appointed by President Madison attorney of the United States for the district of Virginia, and from 1817 to 1829 was attorney-general of the United States. On his retirement he passed the rest of his life in the practice of his profession at Baltimore. He delivered in 1826 in the hall of representatives in Washington a eulogy on Adams and Jefferson. In 1832 he was the candidate of the Anti-Masonic party for president of the United States. Consult: Kennedy, 'Memoirs of the Life of William Wirt' (1849); Trent, 'English Culture in Virginia' (1889).

Wiscasset, Maine, town, county-seat of Lincoln County, on the Sheepscot River, and the Maine Central Railroad; 40 miles northeast of Portland. It is in a region noted for picturesque scenery, and is a popular summer resort. It has a good harbor, and is a port for coasting vessels; some vessels are built here, and the town also contains a shoe factory and large saw-mills. There is a national bank, capital \$100,000, and a savings bank. It has several elementary schools, and a public academy (high school) founded in 1877. Pop. (1890) 1,733; (1900) 1,273; (1910) 1,267.

Wisconsin, wis-kon'sin, a north-central State of the United States, sometimes called the "Badger State." Admitted to the Union 29 May 1848. It is between lat. 42° 30' and 47° N. and lon. 87° 30' and 92° 30' W. Bounded on the north by Lake Superior and the upper peninsula of Michigan, east by Lake Michigan, south by Illinois, and west by Iowa and Minnesota. The Mississippi and St. Croix rivers flow along the greater part of the western border. Its gross area is 56,040 square miles, or 35,840,000 acres. The State is divided into 71 counties. Its greatest length is 316 miles and breadth 295 miles. The State capital is Madison, and the leading manufacturing and commercial city is Milwaukee. The population in 1910 was 2,333,866.





Topography.—Wisconsin represents an elevated undulating plain with an altitude of from 600 to 1,800 feet above sea level. A ridge some 30 miles south of Lake Superior forms the watershed of the State, the ground sloping therefrom in all directions. High cliffs extend along the east shores of Green Bay and Lake Winnebago. The greatest depression in the State is the surface of Lake Michigan, 578 feet above the sea. The Mississippi River at the mouth of the Platte, eight miles above Dubuque, is 591 feet; at Prairie du Chien, 602; at La Crosse, 632; and at the mouth of the St. Croix, 677—it therefore has a descent in this part of its course of 5 inches per mile. The descent of Fox River from Lake Winnebago to Green Bay is 170 feet, forming one of the most valuable series of water powers in the West. No part of the United States excels the valley of the upper Mississippi in the great beauty of its bluff and woodland scenery.

Rivers and Lakes.—The Mississippi River forms the western boundary of the State for about 250 miles, and in that distance receives the waters of the Wisconsin, Black, Chippewa, and Saint Croix, all large streams, draining respectively areas of 11,000, 2,200, 9,000 and 3,600 square miles. The other principal rivers are the Rock, another tributary of the Mississippi; the St. Louis, Bois Brulé, Bad, and Montreal, flowing into Lake Superior; the Menominee, Peshtigo, Oconto, Pensaukee, and Fox, with its tributary the Wolf, flowing into Green Bay; and the Manitowoc, Sheboygan, and Milwaukee, tributaries of Lake Michigan. Innumerable smaller streams irrigate almost the whole surface; their waters are usually clear, originating in springs and small lakes. Several of these at the north are precipitated over rocky barriers, forming often beautiful cascades or rapids; and at the south several run through narrow rocky gorges called "dalles." The Mississippi is navigable for steamboats throughout its course along the border of the State; the Wolf and Fox rivers are navigable for small steamboats, the latter having been artificially improved with slack-water dams; and many of the streams afford ample water power for manufacturing purposes. Besides the two great lakes, Superior and Michigan, there are numerous others, especially in the central and northern portions of the State; these are from 1 to 20 or 30 miles in extent, often with high, picturesque banks, and deep water, abounding in fish. The largest lake in the State is Winnebago, 28 miles long and 12 miles wide, covering an area of 212 square miles. The other principal lakes are Saint Croix, Pepin, Little and Great Butte des Morts, Mendota, Monona, Waubesa, Kegonsa, Puckaway, Pewaukee, Geneva, Green, and Koshkonong.

Climate.—The mean annual temperature of the southern portion of the State is 46° F.; mean temperature of winter 20°; of spring and autumn 47°, and of summer 72°. The waters of Lake Michigan materially affect the temperature of the counties along its shores, moderating both the excessive heat of summer and the cold of winter; and hence the temperature of January at Milwaukee is found on the Mississippi River half a degree of latitude farther south, and that of July at Saint Paul, 2° farther north. The northern part of Lake Michigan is generally covered with ice in the winter, but the sheet

seldom reaches as far south as Milwaukee, where navigation generally continues open during the entire year. Snow almost always falls in the northern part of the State before the occurrence of heavy frosts, protecting the ground and the roots of plants from freezing, and from its melting accelerating the growth of vegetation in the spring. The prevailing winds of spring are from the N. E.; of summer, S. E.; of autumn and winter, W. The winters are cold, mostly uniform, with many clear, dry days; the springs are backward; the summers short and often hot; the autumns prolonged, mild, and usually pleasant. The annual quantity of rain and melted snow is about 32 inches. The barometer varies in its extremes from 28 to a little above 30 inches, the mean being about 29.5.

Geology.—The rock formations present in the State of Wisconsin begin with the very oldest, the Archæan, and extend up to the Devonian, which is represented by a small area near the city of Milwaukee. The Archæan rocks occupy a dome-like area in the north-central part of the State, mantled about by the sandstones, shales, and limestones of the Cambrian and Silurian age. The Archæan rocks consist of granite, greenstone, gneiss, schist, quartzite, and crystalline limestone. The Cambrian and Silurian rocks have their beds sloping in all directions away from the central Archæan area. Within the Silurian rocks the Trenton and Niagara formations are filled with fossils. In addition to the large central area of Archæan rocks, a smaller area is found forming the elevated area of bluffs near the town of Baraboo. The later beds of the Archæan formation are rich in minerals, particularly those containing copper and iron. In the southwestern part of the State the Silurian formations are important by reason of the areas of zinc and lead which they contain.¹

Minerals.—The mineral resources of the State are very extensive. Lead, copper, iron, and zinc occur abundantly and are mined with profit. The principal mineral productions in 1900 included red hematite, 733,212 long tons; brown hematite, 12,793 long tons; granite (1900) \$742,878; sandstone, \$335,470; limestone, \$38,269; clay products, \$3,000,486; coke, 48,000 short tons in 1900 (no report in 1909); and mineral water valued at \$15,958. The lead mines of the State were first discovered by the French, in the middle of the 17th century; but attracted little attention until 1826, from which time the quantity of lead produced increased rapidly, until the discoveries in the Black Hills overshadowed the importance of the Wisconsin mines.

Agriculture.—Nearly 60 per cent of the land area of Wisconsin is included in the farms of the State. There were 176,546 farms in 1910. Much of the northern part was until recently covered with extensive forests of white pine, balsam, hemlock, and other cone-bearing evergreens, but these have suffered serious diminution from lumbering operations. The soil in the north is, in large measure well adapted to agriculture, although there are large sandy tracts only suited to the growth of pine forests; the prairies in the south and central portions are exceedingly rich and productive, raising the cereals, tobacco, sugar beets, and potatoes in great quantities.

¹ This paragraph is by Prof. William H. Hobbs, of the University of Wisconsin.

WISCONSIN

According to the somewhat uncertain census returns, the principal farm crops in 1910 were corn, 51,188,000 bushels, valued at \$26,618,000; wheat, 3,659,000 bushels, valued at \$3,366,000; oats, 69,136,000 bushels, valued at \$23,506,000; barley, 22,429,000 bushels, valued at \$14,355,000; rye, 4,890,000 bushels, valued at \$3,465,000; buckwheat, 196,000 bushels, valued at \$147,000; potatoes, 24,700,000 bushels, valued at \$9,386,000; and hay, 2,260,000 tons, valued at \$34,126,000. The average values per acre of the principal crops are as follows: Flowers and plants, \$1,396; onions, \$125; nursery products, \$116; tobacco, \$86; small fruits, \$67; miscellaneous vegetables, \$54; hops, \$53; broom corn, \$39; sweet potatoes, \$85; potatoes, \$23; dry beans, \$16; flaxseed, \$13; dry peas, \$12; cereals, \$9; hay and forage, \$8; and orchard fruits, \$5. The crops yielding the best average returns per acre were grown upon highly improved ground. Their production required a relatively great amount of labor, and large expenditures for fertilizers.

The value of all livestock on farms in 1910, was \$158,454,043. Of this amount 43.3 per cent represents the value of horses and colts; 42.5 per cent cattle, including dairy cows and meat cattle, 8.6 per cent swine, 2.3 per cent sheep and lambs; 2.8 per cent poultry; and 5 per cent that of all other livestock. Dairying is an important branch of agriculture in Wisconsin. In 1900 the value of dairy products was \$26,779,721, being 17 per cent of the value of all farm products. Of this amount, 78.6 per cent represents the value of dairy produce sold, and 21.4 per cent that consumed on the farms of the producers. Of the former amount, \$15,717,043 was received from the sale of 252,450,051 gallons of milk; \$4,508,775 from 26,931,757 pounds of butter; \$686,689 from 1,638,601 gallons of cream, and \$135,038 from 1,558,575 pounds of cheese.

Manufactures.—In 1910 Wisconsin had 9,722 manufacturing establishments, employing 3605,066,000 capital and 205,022 persons, paying \$110,743,000 for wages and \$346,383,000 for materials; and having an aggregate output valued at \$590,466,000. The principal manufactures, according to the values of output (1900): lumber and timber, \$57,634,816; flour and grist, \$26,327,942; foundry and machine shop products, \$22,252,730; cheese, butter, and condensed milk, \$20,120,147; leather, \$20,074,373; malt liquors, \$19,394,709; packed meat, \$13,661,125; and paper and wood pulp, \$10,895,576. The iron output aggregated over 116,000 tons of pig-iron and 60,000 tons of rolled iron. Manufactures of leather amount to \$9,000,000; and beer is produced, chiefly at Milwaukee, to the value of \$11,000,000 annually. The remarkable growth of manufactures in Wisconsin is to be attributed to an abundant supply of materials and excellent market facilities. Manufacturing is not concentrated in a few localities, but is well distributed throughout the State. Six large rivers—the Menominee, Saint Croix, Chippewa, Wisconsin, Rock, Fox, and Wolf—with many smaller streams, and the outlet of many of the 2,000 fresh-water lakes in the northern part of the State afford enormous water power, as yet only partially developed. On the shores of Lake Michigan and Green Bay are 11 important manufacturing cities, all accessible to lake-going vessels; and the cities of Ashland and Superior, on

Lake Superior, are large and growing manufacturing centres. Wisconsin in 1900 was the first among the States in the value of its timber and lumber products; Michigan, which was first in 1890, having suffered a much greater decline. But so rapid has of late been the work of the lumbermen, that Wisconsin's lumber industry is fast dropping to a much lower stage, the principal operators having already withdrawn from the State to the South and far Northwest. Most of the timber has been removed from the southern part of the State, yet in the north there is still much pine, hemlock, spruce, and deciduous varieties. During the year 1900 there were produced 3,389,166,000 feet of sawed lumber. The manufacture of flouring and grist-mill products ranked second among the industries of the State in 1900, with 717 establishments, 1,412 wage-earners, and products valued at \$26,327,942. In 1890 there were 497 establishments, 1,770 wage-earners and products valued at \$24,252,297. The increase in the value of products during the decade was \$2,075,645. There were 47 establishments engaged in the manufacture of paper and wood pulp in 1900, with 4,240 wage-earners, and products valued at \$10,985,576. In 1890 there were 27 establishments, 1,779 wage-earners, and products valued at \$4,475,368. The increase in the value of products during the decade was \$6,420,208. These mills are situated mainly on the large rivers which afford the abundant power so essential to the successful conduct of this industry. The large quantities of spruce, hemlock, and other woods used are furnished by the forests of the State, and the quality of the water is unexcelled for paper-making purposes. There were 76 establishments engaged in the manufacture of furniture in 1900, with 7,775 wage-earners, and products valued at \$3,721,823. In 1890 there were but 46 such establishments, 2,600 wage-earners, and products valued at \$3,616,317. The increase in the value of products during the decade was \$5,105,506.

Transportation.—The first railroad in Wisconsin was built in 1850. In 1904 the principal railroads traversing the State were the Chicago and Northwestern; the Chicago, Milwaukee and Saint Paul; the Wisconsin Central; the Chicago, Saint Paul, Minneapolis and Omaha, and the Minneapolis, Saint Paul and Sault Sainte Marie. The total length of railroads within the State in 1904 was 6,970 miles.

Banks and Banking.—In the State in 1909 there were 125 national banks in operation, having 135,551 depositors and \$40,774,994 savings deposits. There were also 358 State banks with 170,548 depositors and \$34,870,310 deposits, 3 savings banks with 6,249 depositors and \$1,144,513 deposits; and 8 loan and trust companies with 12,617 depositors and \$2,237,470 deposits. The exchanges at the United States clearing house at Milwaukee, during the year ending 30 Sept. 1909 aggregated \$590,078,300, an increase over those of the preceding year of \$52,052,380.

Government.—The government of the State is in accordance with the constitution adopted 18 February, and ratified by a vote of the people 14 March 1848. By it certain personal rights are secured to every citizen, adequate remedies for wrongs secured, the crime of treason clearly defined, leases of land for agricultural purposes longer than 15 years prohibited, and aliens ab-

lowed to hold and convey property; all white male citizens and persons who have declared their intention to become citizens, who are 21 years of age and who have resided in the State one year, have the right to vote. The governor is elected for a term of two years, and receives a salary of \$5,000 per annum. Legislative sessions are held biennially in odd-numbered years, beginning on the second Wednesday in January, and there is no limit to length of session. The Legislature has 33 members in the Senate and 100 in the House, each of whom receives \$500 per biennial period and mileage. There are 11 representatives in Congress. The State government in 1908 was Republican. There is a supreme court of six members elected for 10 years.

State Finances.—In 1910 Wisconsin had no indebtedness except for the following trust funds. School fund, \$1,563,700; normal school fund, \$515,700; university fund, \$111,000; agricultural college fund, \$60,600; total, \$2,231,000. The actual valuation in 1910 was Real estate, \$1,901,290,225; personal property, \$577,271,961; total \$2,478,561,786; State tax rate, \$1.36 per \$1,000, and total taxes raised, \$1,345,570. The receipts for the year are over \$5,300,000, expenditures, \$5,000,000; balance in the State treasury, about \$300,000.

Charities and Correction.—The penal and charitable institutions are managed by a State board of control, appointed by the governor. The incurable insane are cared for in county asylums, supported both by the State and county. There are State insane hospitals at Mendota and Winnebago; a School for the Blind at Janesville; Home for the Feeble-Minded at Chippewa Falls; School for the Deaf at Delavan; Industrial School for Boys at Waukesha; and State School for Dependent Children at Sparta. The State Prison is at Wausau, and the State Reformatory at Green Bay.

Education.—In 1908 the children of school age in Wisconsin numbered 690,493; the enrollment in public schools, 465,306, the average daily attendance, 309,415. There were 8,000 public school buildings, public school property valued at \$18,000,000, and 14,659 teachers. For higher education there were 269 public high schools, 19 private secondary schools, 12 public and 3 private normal schools, 10 universities and colleges for men and for both sexes, and the Milwaukee-Downer College for Women, at Milwaukee. The principal colleges include the University of Wisconsin (q.v.), at Madison; Beloit College, at Beloit; Marquette and Concordia Colleges, at Milwaukee; Lawrence University, at Appleton; Northwestern University, at Watertown; Ripon College, at Ripon; Milwaukee Medical College and Wisconsin College of Physicians and Surgeons, at Milwaukee.

Religion.—The strongest denominations in the State are the Roman Catholics, Lutheran, Independent Synods, Methodist Episcopal; Congregational; regular Baptist, Evangelical Association, German Evangelical Synod; and Presbyterian. There are about 7,000 Evangelical Sunday-schools, with 22,880 officers and teachers, and 450,000 scholars.

Population.—Soon after the admission of Wisconsin to the Union in 1848 efforts were made to attract immigration by the offer of cheap lands, and the result has been an unusually large foreign element in the population—

chiefly German and Scandinavian, but including also French, Swiss, and most other European peoples. Many of these foreigners settled in communities, some of which have tenaciously preserved their original language and customs. The population in the State in 1830 was 3,245; (1840) 30,945; (1850) 305,391; (1860) 775,881; (1870) 1,054,670; (1880) 1,315,497; (1890) 1,686,880; (1900) 2,069,042, and in 1910, 2,333,860. There are also about 6,000 tribal Indians living on Federal reservations. The leading cities in the State in the order of their population are as follows: Milwaukee, 373,857; Superior, 40,384; Racine, 38,002; La Crosse, 30,417; Oshkosh, 33,068; Madison, 25,531; Sheboygan, 16,359; Green Bay, 19,100; Eau Claire, 18,310; Marinette, 14,610. Fond du Lac, 18,797; Appleton, 16,773; Janesville, 13,894; Ashland, 11,594; Wausau, 16,950; Manitowoc, 13,027; Kenosha, 21,371.

Indian Reservations.—The Indian reservations in Wisconsin are La Pointe, Menominee, Oneida, and Stockbridge. The Stockbridge are self-supporting, largely through annuities and sales of lumber-cutting rights, but take little interest in agriculture. The Menominee and Chippewa, on the Menominee and La Pointe reservations, respectively, also derive most of their support from the sale of their timber. The Menominee are dependent upon Government rations for 20 per cent of their subsistence. La Pointe, or Bad River, reservation, is situated in Ashland county, and comprises an area of 194 square miles. These Indians are a portion of the Lake Superior band of Chippewa (Algonquian) with a population of 627. The Menominee and Stockbridge reservations, embracing areas of 368 and 18¼ square miles, are located in Shawano and Oconto counties. The Menominee (Algonquian) are an aboriginal Wisconsin tribe and have a present population of 1,487. Their principal occupations are lumbering and farming. The Stockbridge and Munsee tribes, of Algonquian stock, originally lived in New England; later they moved to western New York, and thence to Wisconsin; they are non-consolidated, and number 376. The Oneida reservation, now existing as such only in name, is situated in Brown and Outagamie counties. The entire area, 102 square miles, has been allotted, with the exception of a small tract for school purposes. The Oneida (Iroquoian) were formerly a portion of the Six Nations of New York, where they resided before being sent to Wisconsin. Their present population is 1,704. In Calumet County are many Stockbridge, Brothertown, and Munsee farmers, without tribal relations, and following the pursuits of husbandmen. There are nearly 8,000 Indians and half-bloods in the State, either as citizens or in tribal relations—as large a number as at any period in its history.

History.—The region west of Lake Michigan was first visited by French explorers. Jean Nicolet, an agent of Champlain, arrived in 1634. In 1658-59 two fur traders, Radisson and Groselliers, visited the Mississippi and the former wrote a journal of their travels. In 1665 a Jesuit mission at La Pointe was founded by Father Claude Allouez, and three years later he established the mission of St. Francis Xavier on the shores of Green Bay. In 1673 Father Jacques Marquette, accompanying Louis Joliet,

reached the Mississippi by passing through Wisconsin; and later Duluth, Father Louis Hennepin, the famous La Salle, and other Frenchmen traced waterways within the territory. Trading posts were established about this time, becoming dependencies of Mackinac. The earliest explorers found the Chippewa on the borders of Lake Superior, at war with the Sioux, on the headwaters of the Mississippi. The Menominee, Winnebago, Mascouten, Miami, Pottawatomie and Kickapoo occupied other portions of the same district. At a later period the Pottawatomie and the Sauk and Foxes were in possession. Artificial earth-mounds (see *MOUND BUILDINGS*), in the form of animals, such as the lizard, bird, turtle, and buffalo, are still to be found in various parts of the State. The navigation of the upper lakes was begun in 1679, when La Salle's "Griffon" made a trip from Niagara River to Green Bay, and was lost on her return voyage. About 1750 a fixed settlement was established at Green Bay by Charles de Langlade; and at the close of the Revolutionary War, Prairie du Chien, at the mouth of the Wisconsin, grew into a like settlement; a few years later La Pointe (at first on the mainland, but soon thereafter on Madeleine Island, in Chequamegon Bay) and Portage became permanent trading posts. England retained Mackinac after the treaty of 1763, and American dominion was not felt by the Wisconsin traders until after the War of 1812-15. The formation of Astor's American Fur Company to establish fur trade in this region was followed by a law forbidding English traders within the territory, which resulted in an increase of American influence. By the ordinance of 1787 Wisconsin became a part of the Northwest Territory. In 1800 it was included in Indiana Territory. In 1809 the region was annexed to the territory of Illinois, as then formed, and so continued till the conversion of the latter into a State in 1818, when Wisconsin, which was yet a wilderness, was annexed to Michigan Territory for such government as was needed. In 1826 lead was discovered in large quantities at Potosi and Mineral Point, and there was a great rush of immigrants to that section. The Indians soon became troublesome, and the Black Hawk war ensued in 1832. Treaties were a few years later made with the Indians, by which most of them removed to reservations beyond the Mississippi. In 1836 the population had increased to such an extent that a territorial government was organized, which at first included a part of the upper peninsula of Michigan, the whole of Minnesota and Iowa, and that part of the Dakotas lying east of the Missouri and White Earth rivers. On the admission of Michigan into the Union as a State, a part of the Lake Superior region was set off to her, and when the Territory of Iowa was formed, it included all the region west of the Mississippi; later, the territory west of the St. Croix was given by Congress to Minnesota. The first effort to procure the admission of Wisconsin to the Union as a State was made in 1846. A constitution drafted during that year was ratified in March, 1848, and the State was admitted to the Union by Act of Congress, 20 May 1848. Under this constitution, with some amendments, it is still governed. During the War of Secession the

State furnished 91,327 soldiers to the Federal Army.

Bibliography.—Wisconsin Historical Collections, 17 vols. (1854-1904); Parkman Club Publications (1896-7); Butterfield, 'Discovery of the Northwest' (1881); Hebbard, 'History of Wisconsin Under the Dominion of France' (1890); Lapham, 'Wisconsin' (1846); Smith, 'History of Wisconsin' (1854); Strong, 'History of the Territory of Wisconsin' (1885); Thwaites, 'Story of Wisconsin' (1890 and 1899); and 'Stories of the Badger State' (1900); 'Historic Waterways' (1888 and 1903); Legler, 'Leading Facts in the History of Wisconsin' (1898); and various monographs published by the State Historical Society.

Revised by R. G. THWAITES.

Wisconsin, a river in the State of Wisconsin. It has its rise in Vieux Desert Lake, on the northern boundary of the State, flows south to Portage City, then southwest, and enters the Mississippi four miles below Prairie du Chien. Total length about 625 miles. It is navigable for 200 miles to Portage City, from which point it is connected with Fox River by a canal. Shifting sandbars in this river are a hindrance to navigation. There are several waterfalls along its course, the most famous of which are known as The Dalles of Wisconsin and Grandfather Bull Falls. Some of the bluffs which line the picturesque gorges are fully 400 feet high.

Wisconsin Phalanx. See *RRON, Wis.*

Wisconsin, University of, the State University located at Madison, Wis. As early as 1836 the legislature of the territory then known as Wisconsin passed an act for the establishment of "Wisconsin University" at Belmont, now in the State of Iowa, but the institution was never organized; again in 1838 a law was passed for the establishment of the "University of the Territory of Wisconsin," a board of visitors was appointed, and the national endowment of two townships of land received. Nothing further was done, however, until 1848, when the State Constitution provided for the establishment of a State university, and the university was incorporated by act of the legislature. A preparatory department was opened in 1849, and the collegiate department in 1850. In 1854 a second grant of two townships of land was made by Congress; but this land as well as that of the first grant was sold at very low prices to attract settlers, and the income derived from the fund was meagre; no State appropriation was made till 1870. In 1858 the University was reorganized, the work of the preparatory department restricted, and the collegiate department organized in six schools; during the War of Secession a large number of students entered the army, and though the work of the university was not suspended, no commencement was held in 1864. Since the war the progress of the university has been continuous. In 1866, a reorganization was effected. The Federal grant under the "Morrill Act" for the establishment of colleges of agriculture and industrial arts was given to the university. Colleges of agriculture and engineering were then established as integral parts of the university. Women, who had been admitted since 1863 to a "normal" department, were given the opportunity to follow a regular collegiate course. At this time, however, the co-educational system was not

complete as the work of the women was kept separate from that of the men; but a few years later complete co-education was established. In 1873 the legislature appropriated \$10,000 a year to the university; in 1876 an annual tenth of a mill tax was appropriated; in 1883 and 1891 other mill taxes were added; in 1899 all mill taxes were consolidated with a grant of one per cent of the railroad licenses into a specific annual grant, which was increased in 1901 and again in 1903. The total income from all sources was \$674,000 in 1902-3. At the time of the first annual grant of \$10,000 a system of free tuition to graduates of high schools in the State was adopted, which led to the elimination of the preparatory department a few years later. This also resulted in making the university the actual head of the public school system of the State.

Since 1899 the university has extended its work in all directions; a number of special courses have been added, particular emphasis has been laid on graduate work, and the number of graduate students increased. The university now includes the following colleges and schools: (1) the College of Letters and Science; (2) the College of Mechanics and Engineering; (3) the College of Law; (4) the College of Agriculture; (5) the Graduate School. It also conducts a summer school and a university extension department. The College of Letters and Science includes beside the general departments of instruction in arts and science, the several special departments as follows: The courses in commerce, pharmacy, education, and home economics, the School of Music, the pre-medical course, the normal graduates' course, and the Washburn Observatory. The degree of A.B. is conferred upon the graduates of the College of Letters and Science, except in the pharmacy and normal graduate courses; for this degree the work is largely elective; in the Freshman year an English course is required, and during this year the other studies are elected from two groups, (1) language, (2) mathematics, science, and history. Certain minima in these groups must be offered, the total covering somewhat less than two years' work. Not later than the beginning of the Junior year a major subject in some one department must be elected, and the remainder of the work is free electives. A limited amount of elective work may be taken in the colleges of Engineering and Agriculture, in the School of Music, or in the special courses of the College of Letters and Science. A special two years' course is arranged for normal school graduates, for completion of which the degree of Ph.B. is conferred. The special courses in pharmacy cover four years, leading to the degree of B.S., or two years, leading to the degree of Graduate in Pharmacy. The College of Engineering was organized in 1870; it offers six four years' courses leading to the degree of B.S.; these are in civil, sanitary, mechanical, electrical, and general engineering, and applied electrochemistry; the course in general engineering includes an elective course in mining engineering. The College of Agriculture offers a "long course" of four years, leading to the degree of B.S., a short course of two years, winter and summer dairy courses, and a farmers' winter course; this college also includes the Agricultural Experiment Station and the organization of farmers' institutes. The College

of Law was established in 1868; it offers a three years' course leading to the degree of LL.B. The Graduate School received its present organization in 1895. It includes work in the College of Letters and Science, the College of Engineering, and the College of Agriculture, courses especially for graduate work being offered in each department of these colleges; the school as a whole is under the control of a faculty committee. The degrees conferred are A.M., M.S., Ph.D., C.E., E.E., and M.E. The Summer School offers courses in the subjects of the general college curriculum, in education, in gymnastics, and a special normal course, it also includes a summer school in shop and laboratory work for mechanics. Tuition in the university is free to Wisconsin students except in the College of Law. There are eight scholarships for undergraduates, and four student loan funds; there are also 31 fellowships, five of which are in special departments, and 18 graduate scholarships, six of which are for special purposes.

Gymnasium work and military drills are required of men students during part of the course, and gymnasium work of women students. There is also ample provision for athletic sports, which are under the general control of an Athletic Council, on which the faculty is represented. The University of Wisconsin is the only institution of the kind in the West which has a boat crew. The women students have organized an athletic association. The students maintain four men's literary societies and one women's society in the College of Letters and Science, and two debating societies in the College of Law; the four men's societies and the two law societies form the intercollegiate debating society from which debaters for intercollegiate contests are chosen; two of the men's societies and the women's society were organized in the early days of the university, and have always had a prominent part in student life. There are also a Science Club, dramatic clubs, and numerous other special associations, a Woman's Self-Government Association, and chapters of the honorary fraternities of Phi Beta Kappa and Tau Beta Phi (engineering). The university campus contains about 450 acres, bordering on the south shore of Lake Mendota; in the eastern part of the grounds, the land rises abruptly in two hills, of which the eastern and higher is known as University Hill. On this hill are most of the college buildings; the Washburn Observatory stands on the western hill, which is known as Observatory Hill, further west is the farm with its barns and buildings; to the east of University Hill is the Lower Campus, used largely for athletic sports; the State Historical Society Library Building, containing the libraries of the society and the university, also stands at the western end of this campus. Among the prominent buildings on and near University Hill are North Hall, South Hall, and University Hall, Chadbourne Hall, Assembly Hall, Science Hall, and the Engineering Building; on and near Observatory Hill are the Hiram Smith Hall (dairy), the Horticultural-Physics Building, and the new Central Agricultural College (completed in 1904). The University Library in 1904 contained 86,000 volumes; in addition to which there are departmental libraries, the State Historical Library, and other libraries open to students. The State

Historical Library and the University Library are in one building, practically on university ground, and although they are administered by separate staffs, are in effect one library for the use of students. Thus there are about 250,000 bound volumes and half as many pamphlets accessible for the purposes of the university. The collection is particularly strong in American and English history, Greek, political and social science, Shakespeare, and the publications of American learned societies. The students in 1904 numbered 3,227, of whom 1,312 were in the College of Letters and Science, 744 in the College of Engineering, and 525 in the College of Agriculture. The University of Wisconsin ranks among the first of the State universities both in numbers and in standard of scholarship.

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Wisdom, Book of, the name of one of the so-called apocryphal books of the Old Testament. See **WISDOM OF SOLOMON**.

Wisdom of Solomon, a book regarded by Protestants as apocryphal, but accepted by Roman Catholics as part of the canon of the Old Testament. It purports to be the work of Solomon, but the Protestant view is that it was the composition of a Jew of Alexandria about a century before Christ. The author states that he is a king and the son of a king, that he prayed to God for wisdom, and received both wisdom and riches. God directed him to build a temple on the holy mount. Righteousness and wisdom are commended, and unbelievers and idolatry are denounced, and examples are given from the Mosaic writings to show how the judgments of God overtake the worshippers of false gods, and the wicked generally. Nor is the author content with indicating earthly penalties for wrongdoers. He points plainly to rewards in a future life for the good, and punishments for the wicked, and without referring to the resurrection of the body, he teaches the immortality of the soul. The book was highly esteemed among the Jews, and was evidently well known to St. Paul, as the epistles to the Romans, the Corinthians, and Ephesians indicate. Under the name of 'Wisdom' in the Roman Catholic canon of the Old Testament, the book is in the list recognized by the Council of Trent as inspired Scripture. The Roman Catholic position is that it was truly the work of Solomon, and that the Alexandrian Greek version was a translation from the original Hebrew.

Wise, Daniel, American Methodist clergyman and author: b. Portsmouth, England, 10 Jan. 1813; d. Englewood, N. J., 1898. He came to the United States in 1832, entered the Methodist ministry, edited the 'Sunday School Messenger' 1838-43, and 'Zion's Herald' 1852-6, as well as many Sunday School publications. He published more than 50 books for young people, mostly under the pen-names of 'Francis Forrester' and 'Laurence Lancelwood.' Among these are: 'Personal Effort' (1841); 'Life of Ulric Zwingli' (1850); 'My Uncle Toby's Library' (12 vols. 1853); 'Vanquished Victors' (1876); 'Heroic Methodists' (1882); 'Boy Travelers in Arabia' (1885); 'Men of Renown' (1886); and 'Some Remarkable Women' (1887).

Wise, Henry Alexander, American lawyer and political leader: b. Drummondstown, Accomac County, Va., 3 Dec. 1806; d. Richmond, Va., 12 Sept. 1876. He was graduated from Washington College, Pa., in 1825, was admitted to the bar in 1828, and began the practice of law at Nashville, Tenn. In 1830, however, he returned to Accomac County, where he built up a large practice as a lawyer. He was early active in the Democratic party; was a delegate to the national convention of 1832, and in the same year was elected to Congress. After the election, he fought a duel with his opponent, on the latter's challenge. On the removal of the government deposits from the United States bank, Wise, with other Democrats in the House, joined the Whigs in opposition against President Jackson. He was, however, re-elected to Congress in 1834 and in 1836; and also opposed Van Buren's banking and sub-treasury plan. In 1837 he acted as the second of Graves, of Kentucky, in a duel with Cilley, of Maine, both members of Congress, in which the latter was killed. This occurrence led to much denunciation of Wise, who was, however, ascertained not to be responsible for the affair. In 1840 he was instrumental in securing the nomination of Tyler for the vice-presidency, and after Tyler became President exerted an important influence on the administration policy. In 1844 he was appointed minister to Brazil; and on his return to the United States in 1847, again gave his support to the Democratic party. In 1854 he was Democratic candidate for governor of Virginia, conducted an active campaign, particularly against the Know Nothing party, and was elected by a majority of 10,000. Toward the end of his term as governor occurred the seizure of Harper's Ferry by John Brown and his followers, and the execution of John Brown at Charlestown, 2 Dec. 1859, was one of the last acts of his administration. He was a member of the State convention which met at Richmond in 1861 to consider the relations of Virginia to the Federal government, and one of the committee on Federal relations to whom the principal business of the convention was referred. He favored a compromise between North and South, and the avoidance of hostilities if possible; but after Virginia declared for secession he loyally supported the Confederate cause. He was appointed a brigadier-general in the Confederate army, and occupied the Kanawha Valley; but was rapidly driven out by Gen. Cox, in a series of skirmishes. He continued to serve in western Virginia until he was sent to Roanoke Island, N. C., with instructions to defend it. At the time of the attack upon the island by Gen. Burnside, in February 1862, he was ill on the mainland, but the greater part of his brigade, known as the Wise legion, took part in the action. He was later at the battle of Appomattox. After the war he resumed the practice of law in Richmond. He wrote 'Seven Decades of War' (1872). Consult: B. H. Wise, 'Life of Henry Alexander Wise' (1899); J. S. Wise, 'End of an Era' (1899).

Wise, Henry Augustus, American naval officer: b. Brooklyn, N. Y., 12 May 1819; d. Naples, Italy, 2 April 1869. He entered the navy as midshipman in 1834, served on the Florida coast during the Seminole War and

on the Pacific coast during the Mexican War, and rose to be chief of the bureau of ordnance and hydrography in 1866. Under the pseudonym of 'Harry Gringo,' he wrote 'Los Gringos; or, An Interior View of Mexico and California, with Wanderings in Peru, Chili, and Polynesia' (1849); 'Tales for the Marines' (1855); 'Scampavias, from Gibel-Tasek to Stamboul' (1857); 'The Story of the Gray African Parrot' (1856), a book for children, and 'Captain Brand of the Centipede' (1860).

Wise, Isaac Mayer, American rabbi and educator: b. Steingrub, Bohemia, 3 April 1819; d. Cincinnati, Ohio, 26 March 1900. He studied at Prague and Vienna, became rabbi at Radnitz, and, desirous of a broader field, emigrated to New York in 1846. He was elected rabbi of a synagogue at Albany, N. Y., but the ritual changes which he favored led to a division in the congregation, and a new temple was organized by his friends. In 1854 he was elected rabbi of the Congregation B'nai Teshurun, of Cincinnati, Ohio. In the same year he wrote a 'History of the Israelitish Nation,' and began to publish 'The Israelite,' followed in 1855 by 'Die Deborah.' Throughout his long years of activity, he sought in pulpit, press, and on platform to advance the cause of progressive Judaism and became its practical and popular leader, to whose efforts were due the Union of American Hebrew Congregations, the Hebrew Union College, and the Central Rabbinical Conference. Among his published works are: 'Essence of Judaism' (1860); 'Judaism, Its Doctrines and Duties' (1862); 'Prayer Book' and 'Hymnal' (1863), which were quickly followed by his 'Origin of Christianity,' 'The Cosmic God,' 'The History of the Hebrews,' 'Second Commonwealth,' 'A Defense of Judaism versus Proselytizing Christianity,' and 'Pronaos to Holy Writ.' He was president of the Hebrew Union College from its foundation in 1875 until his death.

Wise, John, American colonial clergyman: b. Roxbury, Mass., August 1652; d. Ipswich, Mass., 1725. He was graduated from Harvard in 1673 and 10 years later was settled as minister of the second parish church in Ipswich in which position he continued till his death. For remonstrating against the violation of charter rights in levying a province tax without authority from the Assembly, he was fined and imprisoned by Governor Andros in 1687. In 1689 he brought a suit against Chief Justice Dudley for denying him the privileges of the *habeas corpus* act, and in 1690 was chaplain to the expedition to Quebec. He took a decided and successful stand against the attempts of Increase and Cotton Mather to place the Massachusetts churches under the authority of ecclesiastical councils, putting forth two essays on the subject, 'The Churches' Quarrel Espoused' (1710) and 'A Vindication of the Government of New England Churches' (1717). A large edition of both essays was published in 1772 and a 4th edition with historical memoir by J. S. Clark (1860). In the memoir it is stated that several striking passages in the Declaration of Independence are nearly literal transcripts from the 'Vindication.' Consult Tyler, 'History of American Literature' Vol. II. (1878).

Wise, John Sargent, American lawyer, son of Henry Alexander Wise (q.v.): b. Rio de Janeiro, Brazil, 27 Dec. 1846. He studied at the Virginia Military Institute at Lexington, which he left in 1864 to join the Confederate army, was graduated from the law department of the University of Virginia in 1867 and began to practise his profession in Richmond. In 1881 he was elected to Congress from Virginia. He was defeated for governor of his State in 1885. He has published 'Diomed' (1898); 'The End of an Era' (1899), 'The Lion's Skin' (1903); 'A Treatise on American Citizenship' (1906).

Wise, Peter Manuel, American alienist: b. Clarence, Erie County, N. Y., 7 March 1851; d. 22 Sept. 1907. He was graduated at the medical department of the University of Buffalo in 1872; was president of the New York State Commission on Lunacy 1896-1901; and was professor of psychiatry at the University of Vermont 1891-5. He published 'Text-Book for Training Schools' (1896); and monographs on 'Asylums of Great Britain' (1882); 'Sexual Perversion' (1883); etc.

Wise Men of the East, The, the three Magi, who, according to the Gospel of Matthew (ii. 1, 2), followed the guiding star to Bethlehem in order to render homage to the new born King of the Jews. A legend, which can be traced back to the 3d century, calls them kings and later times distinguished them as Melchior, Gaspar, and Balthasar. They are honored at the feast of the Epiphany and in art the youngest is portrayed as a Moor. Their bones are said to have been placed in the cathedral of Cologne and hence they are often referred to as the Three Kings of Cologne.

Wiseman, wiz'man, Nicholas Patrick Stephen, English Roman Catholic prelate: b. Seville, Spain, 3 Aug. 1802; d. London 15 Feb. 1865. He was of Irish parentage, was brought to Ireland in youth and was educated at Waterford, at the Roman Catholic College, Ushaw, near Durham, and the English College at Rome. He took orders in 1825, became professor of oriental languages in the Roman University in 1827 and in 1828 rector of the English College. He returned to England in 1835 and there delivered in 1836 at St. Mary Moorfields, London, a series of lectures on 'The Principal Doctrines and Practices of the Catholic Church,' which attracted much attention. He was consecrated titular bishop of Melipotamos in 1840 and was made archbishop of Westminster and cardinal in 1850. This ecclesiastical appointment caused great excitement among English ultra-Protestants, who termed it a "papal aggression" and resulted in the 'Ecclesiastical Titles Act' prohibiting the assumption of local ecclesiastical titles by Roman Catholics, which was not repealed until 1872. In the midst of the excitement Wiseman put forth a temperate address explaining the constitutional rights of Roman Catholics, entitled 'An Appeal to the Reason and Good Feeling of the People on the Subject of the Catholic Hierarchy' (1850), which was very instrumental in bringing about a better state of feeling. In 1856 he established with O'Connell 'The Dublin Review' and was a regular contributor to it. He was the author of 'Lectures on the Connection between Science and Revealed Religion' (1836); 'Letters on Catho-

the Unity' (1842); 'Papal Supremacy' (1850); 'Fabiola' (1854); 'The Four Last Popes' (1858); etc. Consult: 'Mémorial' by G. White (1865); Lord Houghton, 'Monographs' (1875); Ward, 'Life and Times of Cardinal Wiseman' (1897); Fitzgerald, 'Fifty Years of Catholic Progress' (1900).

Wisham. See WUSHEM.

Wishart, wish'art, George, Scottish preacher and agitator: b. Pitarrow, Forfarshire, about 1512; d. Saint Andrew's 28 March 1546. Leaving Scotland in 1538 to avoid persecution, he became in 1543 a tutor in Christ Church College, Cambridge, where he led, according to the testimony of one of his pupils, a life of singular abstemiousness, charity, and purity. In July 1543, he returned to Scotland with the commissioners sent to negotiate a marriage treaty between Prince Edward and the infant queen of Scots. Under their protection he preached at Montrose, Dundee, and other Scottish towns, and his preaching led the people to destroy some convents and Roman Catholic churches. Arrested at Ormiston by the Earl of Bothwell, he was delivered to Cardinal Beaton, who sentenced him to be burned at Saint Andrew's. Consult Rogers, 'Life of George Wishart, the Scottish Martyr' (1876).

Wishart, or Wischaart, George, Scottish bishop: b. Yester, East Lothian, 1609; d. Edinburgh 1671. He is said to have been educated at the University of Edinburgh, and having entered the Episcopal Church, received a charge at Saint Andrew's. In 1639, having refused to take the covenant, he was deposed from the ministry, and during the supremacy of the Presbyterian party was several times imprisoned. He subsequently became chaplain to Montrose, and after that leader's death to Elizabeth, electress palatine and titular Queen of Bohemia. He accompanied her to England, and on the Restoration was made rector of Newcastle, and in 1662 was consecrated bishop of Edinburgh. He is chiefly known by his 'History of the Wars of Montrose' (1647), written in elegant Latin. When Montrose was executed in 1650, a copy of this work was hung in contumely about his neck. Several English translations of Wishart's work have appeared, the latest in 1819.

Wishoskan, a linguistic stock of North American Indians, comprising the Patawat, Weeyot or Wiyot, and Wishosk tribes, occupying the coast of California from a little below the mouth of Eel River to a short distance north of Mad River, including particularly the country about Humboldt Bay. They also extended up the streams named into the mountain passes. Of these tribes little is known, as they are classed with the "Diggers" on account of their habit of living largely on roots. Their number is small.

Wishram. See WUSHEM.

Wismar, vis'mär, Germany, the second seaport of Mecklenburg-Schwerin, on the Baltic, at the head of a bay of the same name, 20 miles north of Schwerin. It has an excellent harbor, carries on an active over-sea trade, and has varied manufactures. Of the mediæval walls only four gates remain; but the numerous quaint old houses are a feature of the place, and several of the brick churches, as well as the

Fürstenhof, once a ducal residence, date from the 14th and 15th centuries. It was a Hanse town in the 13th century, passed to Sweden in 1649, was taken by the Danes in 1675, and by the Danes, Prussians, and Hanoverians in 1712, when its strong fortifications were destroyed, and in 1803 was pawned to Mecklenburg-Schwerin, which secured it finally in 1828. Pop. about 22,000.

Wismar, Benjamin Blydenburg, American clergyman: b. Goshen, N. Y., 19 Sept. 1794; d. Boston, Mass., 9 Feb. 1835. He was graduated at Union College in 1813 and at Princeton Theological Seminary in 1820. In 1821-32 he was pastor of the Old South Church, Boston, Mass. In the latter year he became secretary of the American board of commissioners for foreign missions, which office he held until his death. Among his works are: 'History of the Old South Church' (Boston 1830); 'Moral Condition and Prospects of the Heathen' (1833).

Wisner, George Y., American civil engineer: b. West Dresden, N. Y., 11 July 1841. He was graduated at the University of Michigan in 1865; served in government survey on the Mississippi River and the Great Lakes 1865-80, and on surveys of the Mississippi, Illinois, and Des Plaines rivers 1880-4. He was superintendent of the 10th and 11th United States Lighthouse districts 1884-7 and since the last-named year has engaged in private practice. His publications include: 'Geodetic Field Work' (1883); 'Brazos River Harbor Improvement' (1891); 'Breakwaters, Sea Walls and Jetties' (1893); 'Hydraulics of Rivers Having Alluvial Beds' (1896); 'Sewage Disposal' (1896); 'Report of Deep Waterway Commission' (1900); 'Canals from the Great Lakes to the Atlantic' (1900); etc.

Wismann, vis'män, Hermann von, German African explorer: b. Frankfurt-on-the-Oder 4 Sept. 1853, o. 15 July 1905. He entered the German army, reaching the rank of lieutenant in 1874, and crossed the African continent in the employ of the German African Society (1880-2). He commanded an expedition sent out by Leopold II., in 1884-5, and as imperial German commissioner, suppressed the Arab revolt under Bushiri, but failed in attempting to take two steamers to Lake Victoria via Nyassa and Tanganyika lakes in 1892. He was governor of German East Africa in 1895-6, and president of the Berlin Geographical Society in 1897. He published 'In the Interior of Africa' (3d ed. 1891); 'Under the German Flag across Africa' (1880-3); 'My Second Crossing of Equatorial Africa' (1891); 'Africa: Descriptions and Advice' (1895); etc.

Wistar, Caspar, American physician: b. Philadelphia, Pa., 13 Sept. 1761; d. there 22 Jan. 1818. He attended the medical department of the University of Pennsylvania in 1782, subsequently studied medicine at the University of Edinburgh, returning to the United States in 1787. He was professor of chemistry and the Institutes of Medicine at the College of Philadelphia 1789-92. In the latter year that institution was united with the medical department of the University of Pennsylvania, and he was there adjunct professor of anatomy, midwifery, and surgery 1792-1808; then becoming professor

WISTAR—WITCH-HAZEL

of anatomy and holding that chair till his death. He was the first to show that the posterior portion of the ethmoid bone was attached to the triangular bones. He opened his house once a week for meetings of students, travelers, scientists, and citizens, and these symposiums continued long after his death, and were known as the Wistar parties. Wistar became a member of the American Philosophical Society in 1767, and succeeded Thomas Jefferson as its president in 1815. He wrote 'A System of Anatomy for the Use of Students of Medicine.'

Wistar, Isaac Jones, American penologist: b. Philadelphia, Pa., 14 Nov. 1827; d. Claymont, Del., 18 Sept. 1905. He was educated at Haverford College, Pa., and served in the Civil War as brigadier-general of volunteers, U. S. A., 1862-5. He was president of the Academy of Natural Sciences of Philadelphia 1892-6, has been inspector of the Eastern penitentiary of Pennsylvania, was president of the State Board of Charities of Pennsylvania, and founded the Wistar Institute of Anatomy and Biology, named in honor of Caspar Wistar (q.v.).

Wistaria, a genus of leguminous climbers, named in honor of Caspar Wistar, an American anatomist (1761-1818), which contains several species, natives of China, Japan, and North America, the correct scientific name of which does not seem to be thoroughly settled. They are high-climbing, hardy shrubs, and have odd pinnate leaves, with entire leaflets, and large, terminal, pendulous racemes of papilionaceous flowers. These have large standards, and wings freed from the keel, which is incurved and obtuse and are usually purple or white in color. The fruits are coriaceous legumes, opening readily. Nearly all of the wistarias are cultivated for covering walls, verandas, trellises, etc. The Chinese wistaria (*W. chinensis*), which was introduced into England about 1816, is perhaps the best. It has profuse dense clusters of pea-shaped flowers, which are about a foot long, and bloom in May before the leaves appear and occasionally again in autumn. When grown over a trellis, the blossoms depend in great masses of blue. This vine is a rampant grower, and the flowering wood may be known by its short, jointed, antler-like growth, and absence of climbing spines.

Wistaria is a favorite plant of the Japanese, who have a variety (*W. chinensis*, var. *multi-juga*), with racemes a yard long, loosely flowered, and with small blossoms, which are fragrant, however. These they train about their houses and over trellises in greatest profusion. The American wistaria (*W. frutescens*) or kidney-bean tree, is not so vigorous as the Chinese species, and has slightly pubescent racemes, only about six inches long. It is found, when wild, climbing over trees at the edges of swamps from Virginia to Florida, and improves with cultivation.

Wistar, Annis Lee Furness, American translator: b. Philadelphia, Pa., 9 Oct. 1830; d. Philadelphia, Pa., 15 Nov. 1908. She was married to Dr. Caspar Wistar (d. 1888) in 1851. She made many translations of note, among them E. Marlitt's 'The Old Mamselle's Secret' (1868); 'Gold Else' (1868); 'The Countess Gisela' (1869); 'The Little Moorland

Princess' (1873), and 'The Second Wife' (1874); Wilhelmine von Hillern's 'Only a Girl' (1870); Hackländer's 'Enchanting and Enchanted' (1871); Volkhausen's 'Why Did He Not Die?' (1871); Von Auer's 'It Is the Fashion' (1872), and Fanny Lewald's 'Hulda; or, The Deliverer' (1874). Her translations were issued in a uniform edition of 30 volumes in 1888. With F. H. Hedge (q.v.) she published 'Metrical Translations and Poems' (1888).

Wister, Owen, American novelist, grandson of Frances Anne Kemble (q.v.): b. Philadelphia 14 July 1860. He was graduated from Harvard in 1882, studied law and was admitted to the Philadelphia bar in 1889, but from 1891 has devoted his attention to literature. He has been especially successful in his delineation of Western life and character and has published 'The Modern Swiss Family Robinson' (1883); 'The Dragon of Wantley: His Tail' (1892); 'Red Men and White' (1896); 'Lin McLean' (1896); 'The Jimmy John Boss and Other Stories' (1900); 'U. S. Grant, a Biography' (1900); 'The Virginian,' which has been widely popular and has been successfully dramatized (1902); 'Oliver Wendell Holmes' in 'American Men of Letters' series (1902); 'Benjamin Franklin' in 'English Men of Letters' series (1904); 'Lady Baltimore' (1906).

Witch, or Wych, Elm, the common broad-leaved elm (*Ulmus montanus*) of England and Scotland, which does not grow to so large dimensions as the field elm; nevertheless at Selborne, Gilbert White measured a witch elm which, seven feet from the ground, was eight feet in diameter. It is a tree of picturesque habit, and, unless grown in crowded masses, rarely produces a straight trunk. It has a wide, spreading head, often slanted to one side, and the branches begin near the base. These drooping branches lash neighboring trees unmercifully, and if they chance to rest on the ground readily strike root. The tree is easily increased by layers or by the abundant seeds. The timber of the witch elm is more durable than that of other English elms, but has their fine-grained, tough, and elastic qualities. It is very flexible when steamed, and is utilized for bent-wood work, frames in boat-building and bows; in olden times if the branches were forked, they served as divining-rods, perhaps because of the likeness in the broad, ovate leaves to that of the hazel, which is one of the so-called lightning plants. These plants are sacred to Thor, are considered to be an actual embodiment of lightning, and their forked branches (having, according to mythology, a resemblance to a lightning flash) are used as talismans to point out the hidden stores of gold or subterranean water.

Witch-hazel, a tall, sometimes arborescent shrub (*Hamamelis Virginiana*) of eastern American woodlands. It has a characteristic horizontal, straggling growth; as Thoreau says: 'Its spray, so jointed and angular, is not to be mistaken for any other.' Witch-hazel is one of the most difficult shrubs to eradicate from a clearing, as it has many diverging stems, so crooked and springy as to render axe-work unsuccessful. The bark is pale-gray, the leaves somewhat resembling the ovate foliage of

WITCH HILL—WITCHCRAFT

Corylus, are more or less oblique, and undulate-edged, not at all handsome, but turning to a beautiful clear yellow in autumn. No sooner have they fallen off, with the rest of the forest foliage, in October or November, than the witch-hazels reclothe themselves with a luminous vesture of filmy, feathery yellow, which turns out to be the long delayed blossoms—whether the earliest or the latest flowers of the year botanists can not decide. Individually, they are not conspicuous, having only four narrow, strap-shaped, golden petals, but are tufted on the twigs as to gild the bushes. Meanwhile the fruits, little blunt, horned woody capsules that have been slowly ripening since the previous fall, begin to gape, and by elastic fissuring, and incurving their walls, shoot their stony-hard, bullet-shaped, polished seeds far and wide. Twigs of this witch-hazel, so unorthodox in its season of blooming, and remotely resembling the hazelnut in foliage, were chosen as material for the forked divining-rods, which, twisting in the hand of the treasure-seeker, or well-digger, pointed downward and disclosed the site of subterranean water or gold. A much more practical use for witch-hazel has been found nowadays. An infusion of the leaves of witch-hazel in alcohol furnishes the familiar slightly astringent and tonic lotion for external inflammations known as "witch-hazel" or "hamamelis." Branches of witch-hazel thrown into the fire exhale the characteristic, peculiar odor of the lotion. Both the foliage and bark, moreover, contain much tannin. The witch-elm (q.v.) of England is also called witch-hazel.

Witch Hill, the name of a hill in Salem, Mass., so called because of the executions of witches which took place there in 1692. It is also known as Gallows Hill.

Witchcraft, supernatural power which persons were formerly supposed to obtain by entering into a compact with the devil. The compact was sometimes express, whether oral or written, when the witch abjured God and Christ, and dedicated herself wholly to the evil one; or only implied, when she actually engaged in his service, practised infernal arts, and renounced the sacraments of the Church. The express compact was supposed to be solemnly confirmed at a general meeting, at which the devil presided, and sometimes privately made by the witch signing the articles of agreement with her own blood, or by the devil writing her name in his "black book." The contract was sometimes of indefinite duration, at other times for a certain number of years. The witch was bound to be obedient to the devil in everything, while the other party to the act delivered to the witch an imp, or familiar spirit, to be ready at call and to do whatever was directed. He further engaged that they should want for nothing, and be able to assume whatever shape they pleased to visit and torment their enemies and accomplish their infernal ends. The belief in witchcraft appears to have existed in various forms among ancient nations, including the Hebrews; it prevails to-day among savage and semi-savage races, and is not extinct in civilized countries. It was always condemned by the Church, and in the 14th century the popes believed that they recognized in sorcery a prevalent and dangerous evil, and began to issue bulls against it. In the 15th century the Inqui-

sition took charge of the work of exterminating witches, and the close of that century, and the beginning of the 16th, witnessed thousands of executions in Germany, Italy, and other countries. France was slow to permit any general persecution of witches, and it was not until about the time of the break with Rome that the first formal enactment, of 1541, declared witchcraft to be a felony in England. From that time on, for more than a century, the burning of witches was kept up in England and Scotland, the statute of 1563 being the first regular enactment against the supposed crime in the latter country.

The Reformation was attended by, or rather, coincident with, an increased intensity of the witchcraft superstition, and its resulting horrors. Theologians of all creeds were equally believers in the reality of compacts with the devil, and regarded the persons who entered into such compacts as unfit to live. It is probable that the religious fervor aroused by controversy over disputed dogmas may have served to bring more vividly to the minds of clergy and laity alike their assumed obligation to obey the Scriptural injunction against witchcraft, and that, in this way, the Reformation may have promoted this form of persecution. Besides, the tribunals actively engaged in crushing out disbelief in the accepted creeds of their respective states, could readily devote any surplus energy and zeal to what seemed to them the related crime of witchcraft. From one end of Europe to the other executions of witches were of daily occurrence, and it is estimated that, from the time of the promulgation of the bull of Pope Innocent VIII. against sorcery, in 1484, until 1782, when the last judicial victim, a servant girl at Glarus, in German Switzerland, was executed, 300,000 women perished on this often imaginary charge. Some of the victims were probably poisoners, but very many of them were undoubtedly innocent of any wrong-doing whatever. Children of tender years were sometimes among the condemned.

Spanish America witnessed many executions on the charge of witchcraft, and it is stated on credible authority that as late as 20 Aug. 1877 five alleged witches were burned alive at San Jacinto, Mexico. This appears to have been more in the nature of a lynching than of an execution of a sentence of a competent court.

In England and Scotland, as already stated, the 17th century witnessed hideous scenes of witch-torture and extermination. The last victims in England were Mrs. Hicke and her daughter, nine years of age, executed in 1716, and the last in Scotland suffered in 1722. Prosecution for witchcraft was abolished both in England and in Scotland by 9 George II. (1736), which made all persons pretending to use the name punishable by imprisonment. By a subsequent act passed in the reign of George IV., they were made punishable as rogues and vagabonds.

All the American colonies had laws against witchcraft similar to those in England at the time, and from the first there were occasional trials and executions on that charge. The great Salem witchcraft delusion, with its attendant tragedies, occurred near the close of the 17th century and was largely due to excitement caused by the teachings and writings of Cotton Mather, the noted Puritan divine, who was a

strong believer in the superstition. The Salem witch frenzy broke out in the family of one Samuel Parris, a minister, but for whose instigation the delusion, with its accompanying sacrifice of innocent lives, could not have obtained the headway it did. A company of girls suddenly began to act mysteriously, bark like dogs, and scream at something unseen. An old Indian servant was accused of bewitching them. The excitement spread and impeachments multiplied. A special court was formed to try the accused, and as a result the jails rapidly filled, and many were condemned to death. It was unsafe to express a doubt of a prisoner's guilt. Fifty-five persons suffered torture, and 20 were executed before the delusion ended. Witches were supposed to be able, with the assistance of the devil, not only to foretell events, but to produce mice and vermin, to deprive men and animals, by touching them or merely breathing on them, of their natural powers, and to afflict them with diseases, to raise storms, etc., to change themselves into cats and other beasts, etc. General assemblies of witches, called "Witches' Sabbaths," were held yearly, or oftener, at which they appeared entirely naked, and besmeared with an ointment made from the bodies of unbaptized infants. To these meetings they were supposed to ride from great distances on broomsticks, poles, goats, hogs, or dogs, the devil taking the chair under the form of a goat. Here they did homage to their master, and offered him sacrifices of young children, etc., and practised all sorts of license till cock-crowing. Neophytes were introduced to the devil at these meetings, and received his mark on their bodies, in token that they had sold their souls to him. As before remarked, the belief in witchcraft still prevails in many parts of the world, and in some countries where pretended sorcerers exert a powerful influence, lives are often sacrificed as a result of their practices and in order that they may continue their nefarious work.

Witenagemot, wīt'-nā-gē-mōt', or **Witenagemote**, originally an assemblage of all the freemen of a tribe or state, among the Teutonic conquerors of southern Britain, but which, in the course of events, and without any special law, resolved itself into an assembly of the princes, aldermen, thanes, large landowners, and leading ecclesiastics. The witenagemot met once a year, or oftener, and had great power, electing a king in the event of disputed succession, approving the regular succession, if there was no dispute, passing upon the trial and punishment of high offenders, enacting laws, and acting as a grand inquest into public affairs. It passed out of existence with the Norman conquest, and the subsequent Parliament was a separate growth, and not a continuation of the Witenagemot. See **ENGLAND**.

Wither, with'ēr, or **Withers**, **George**, English poet and pamphleteer: b. Beantworth, near Alton, Hampshire, 11 June 1588; d. London a May 1677. He studied at Magdalen College, Oxford, was entered at Lincoln's Inn in 1615, devoted much attention to literature, and proved his skill in satiric verse by being thrown into the Marshalsea for his 'Abuses Stript and Whipt' (1613). While there imprisoned he wrote busily, and is said to have composed there several of his best poems, among them 'The

Shepherd's Hunting' (1615), a continuation of 'The Shepherd's Pipe' (1614) of William Browne. In 1621 some official persons thought reflections against the state and leading politicians were to be detected in 'Wither's Motto, Nec Habeo, Nec Careo, Nec Curo' (1621), and again the author was ordered to the Marshalsea, though soon liberated. After 1628 he wrote nothing, save 'Hallelujah' (1641), a collection of religious verse, that in critical estimation attained the rank of earlier work. He became a Puritan, and wrote largely for the furtherance of the political and religious cause with which he was identified. At the revolution, he recruited (1642) a troop of horse for Parliament, and was made captain and the commander of Farnham Castle. When taken by Royalists and in danger of capital punishment, he was released through the interference of Sir John Denham (q.v.), who protested that "so long as Wither lived he [Denham] would not be accounted the worst poet in England." He was promoted major, made a commissioner for the sale of the king's goods, and (1655) became a clerk in the statute-office of the court of chancery. For his 'Vox Vulgi,' a poem dissuading from the restoration which remained in MS. until printed by Macray in 'Anecdota Bodleyana' (1880), he was committed to Newgate in 1660, and imprisoned there until released in 1663 under bond for good behavior. 'Fragmenta Poetica' (1666; reprinted as 'Fragmenta Prophetica,' 1669) was his last work. For some time subsequent to his death he was considered a rimer of no merit, was omitted from collections of English poetry, and included in the 'Dunciad' as "wretched Withers." But Ellis praised him in 'Specimens of the Early English Poets' (1790), and others, including Sir S. E. Brydges by various reprints and Lamb by the essay 'The Poetical Works of George Wither' (Lamb's 'Works,' 1818) obtained for him suitable recognition. His reputation is based chiefly on his earlier work. The greater part of his writings was printed by the Spenser Society (20 pts., 1870-83). Consult besides the books already mentioned Ward's 'English Poets,' Vol. II. (1880).

Witherite, a mineral composed of barium carbonate mined extensively near Hexham, Northumberland, England. Usually found in massive condition though orthorhombic crystals do occur; hardness, 3 to 3.75; specific gravity, 4.29 to 4.35; lustre, vitreous; color, white, often yellowish or grayish; streak, white. Used in the manufacture of baryta for sugar refining, in plate-glass making, and in the adulteration of white lead and zinc white.

Witherspoon, **John**, American Presbyterian clergyman and college president: b. Yester, Haddingtonshire, Scotland, 5 Feb. 1722; d. near Princeton, N. J., 15 Sept. 1794. He was graduated from the University of Edinburgh in 1742, was licensed to preach the next year and was parish minister of Beith, 1745-57. He led a body of militia to the aid of the Pretender at Glasgow in 1745 and was captured at the battle of Falkirk, but was soon released. He was pastor at Paisley, 1757-68, and then accepted the presidency of the College of New Jersey (now Princeton College) in 1768. He was a delegate for six years from New Jersey to the Continental Congress; and a signer of the Declaration of Independence. He greatly increased the efficiency of the college and was a

WITHINGTON—WITTENBERG COLLEGE

noteworthy figure in the political as well as the educational affairs of his time. He wrote: 'Ecclesiastical Characteristics' (1753); 'Nature and Effects of the Stage' (1757); 'Essays on Important Subjects' (1764); 'Considerations on the Nature and Extent of the Legislative Authority of the British Parliament' (1774); etc. His collected works appeared in nine volumes in 1804.

Withington, wíth'ing-tón, England, a manufacturing town in Lancashire, three miles south of the centre of Manchester, in the parliamentary borough in which it is partly included. It contains modern churches and chapels, Lancashire Independent College, a public hall and library, and numerous residential villas. Pop. about 40,000.

Witte, wít'tē, Emanuel, Dutch painter: b. Alkmaar, Holland, 1607; d. Amsterdam 1692. He was a pupil of Van Alst, lived at Delft in 1642 to 1649, and in 1650 went to Amsterdam. His earlier paintings were mostly historical or portraits, but later he devoted some attention to interior decoration with which he was very successful. His works are found at the museums of Amsterdam, Rotterdam, Brussels, Berlin, Hamburg, and Weimar, also in the National Gallery at London, and in some private English galleries.

Witte, Pietro de, Dutch painter: b. Bruges 1548; d. Munich 1628. His general choice of subjects was confined to history, but it is not known under whom he studied in his native country before going to Italy, where he became an intimate friend of Giorgio Vasari, under whom he appears to have formed his style. When Vasari was employed to decorate the Vatican with frescoes De Witte became his favorite assistant, and grew almost completely Italianized in his artistic ideals. He painted equally well in fresco and oils, and was invited to Florence by the Grand Duke of Tuscany, and there executed some important works. His versatility is evidenced by the fact that when Maximilian, the elector of Bavaria, required the services of a designer of tapestry De Witte was commissioned to furnish the necessary cartoons. He was one of the Dutch painters of the Renaissance period who gave himself up entirely to the influence of foreign schools and spent but a short part of his life in the Netherlands. His principal works have been engraved by Jan Sadeler and other famous engravers of his day.

Witte, Sergei Yulievitch, Russian statesman: b. Tiflis 29 July 1849. He was graduated from the New Russian University, Odessa; and in 1877 entered the governmental railway service. He had charge of transporting troops on the Odessa Railway during the Russo-Turkish war, in 1879 was given a position on the South-western Railway, in 1886 became general manager of that road, and two years later chief of the railway department. In 1892 he was made minister of finance, and in this capacity he made several commercial treaties with Germany, aided the development of manufacturing industries, made the sale of alcohol a government monopoly, and established the gold standard. His policy aroused the opposition of wealthy bankers, and of all conservatives, and in 1903 he was removed from the office of minister of finance, but was appointed president of the committee of minis-

ters. In 1905 he, with Baron Rosen, satisfactorily arranged the Treaty of Portsmouth (q.v.), was created a Count, on 30 October was appointed premier but resigned 2 May 1906 and was appointed a member of the council. See *Russia, History*. He wrote 'Principles of Railway Tariffs' (1883); 'Friedrich List, the Economist' (1888).

Wittekind, wít'tē-kind, or **Widukind**, Saxon leader in the struggle with Charlemagne; d. about 807. He came of a noble Westphalian house, and first appears at the head of the Saxon expedition against the Westphalian fortress of Eresburg in 774. Charlemagne's return from Lombardy drove him across the Weser, and instead of submitting to the emperor at the Diet of Paderborn in 777 like many other Saxon leaders, renewing the revolt in 776, he fled to Jutland. He returned during Charlemagne's absence in Spain, laid waste the Rhineland and surprised and annihilated the Frankish army on the Süntelgebirge (782). The emperor retaliated by executing 4,500 Saxon prisoners, an action that aroused the entire Saxon race to arms. The battle of Detmold was decisive (783), but that of Osnabrück forced Wittekind to enter on negotiations, the issue was that in 785 he accepted baptism in the imperial camp at Attigny, in Champagne. The emperor, it is said, made him duke of the Saxons and lord of Engern, and from the castle of Bablonie, near Lübeck, he exercised a benignant sway till he fell in battle with Gerold, the Swabian duke. Various princely houses, as those of Brunswick and Sardinia, claim Wittekind for the founder of their line. The Emperor Charles IV. in 1377 placed a monument to him in the parish church at Enger, where he is supposed to have been buried, and in Menden, Westphalia, a monument was erected to him in 1812. Consult Didekamp, 'Widukind, der Sachsenführer nach Geschichte und Sage' (1877); Mombert, 'Charles the Great' (1888).

Wittenberg, wít'tēn-bērg, Ger. wít'tēn-bērg, Germany, a town of the province of Saxony, Prussia, on the Elbe, 45 miles southeast of Magdeburg. It was the home of the Reformation, and here Luther, while a university professor, nailed his 95 theses to the door of the Schlosskirche. The university in which he was professor was united to Halle in 1817. The principal buildings are the Schlosskirche, in which both Luther and Melancthon are buried; the Stadtkirche, where Luther and Melancthon preached; the remains of the Augustinian monastery, with Luther's apartments; the houses of Melancthon and Cranach; the town hall, the gymnasium, etc. Textiles, hosiery, leather, machinery, pottery, etc., are among its manufactures. Pop. about 20,000.

Wittenberg College, located at Springfield, Ohio. It was founded in 1845 under the auspices of the Lutheran Church in Ohio. Its organization includes a Preparatory School, a Collegiate Department, a Theological Seminary, a School of Oratory, a Conservatory of Music, and a School of Art. There is also a Summer School, designed chiefly for teachers, giving courses in pedagogical methods. The Collegiate Department confers the single bachelor's degree of A.B. for a four years' course. Women are admitted to all departments except the Theological Seminary; and there is also a special shorter collegiate course for young women.

WITTHAUS—WOFFORD COLLEGE

which leads to a diploma, but not to a degree. In 1910 the grounds and buildings were valued at \$500,000; a theological building was erected in 1902; the productive funds in 1910 amounted to \$600,000, the income to \$35,000; the library contained 17,000 volumes. The students numbered 703, and the faculty 35.

Witthaus, wíth'ows, Rudolph August, American toxicologist; b. New York 30 Aug. 1846. He was graduated from Columbia in 1867, and from the Medical Department of the University of New York in 1875, has since been professor of toxicology and chemistry at Cornell University, and held similar chairs in the universities of New York, Vermont, and Buffalo. He became noted as an expert in poisons in connection with many murder cases, and has published: 'Essentials of Chemistry' (1879); 'General Medical Chemistry' (1881); 'Manual of Chemistry' (1879); and 'Laboratory Guide in Urinalysis and Toxicology' (1886). He has edited 'Witthaus and Becker's Medical Jurisprudence' (4 vols.), for which he prepared the introduction, and Vol. IV. on 'Toxicology.'

Witwatersrand, wít-vá'ters-ránd ('White Waters Range,' colloquially 'The Rand'), Transvaal, South Africa, a low range of hills extending 25 miles either side of Johannesburg, since 1886 famous as one of the richest gold-mining districts in the world. See TRANSVAAL, GOLD-MINING IN THE.

Wizom, wík'sóm, Emma. See NEVADA, EMMA.

Wiyot. See WISHOSKAN.

Woad, wód, a cruciferous herb (*Isatis tinctoria*) which has been used for centuries in the countries of temperate Europe, as a dye-plant, yielding an indigo-blue color. The woad has entire foliage, the stem leaves being sagittate, and has large coriaceous pods. Cæsar tells us that the ancient Britons stained their bodies with woad, so as to give themselves a more formidable appearance in battle; and from Pliny we learn that their women, before engaging in certain religious rites, also covered their nude bodies with the dye. The plant was formerly much cultivated in England for the sake of its dye, which was extracted from its crushed and fermented leaves, but the stronger and finer blue produced by the indigo-plant (q.v.) finally superseded it, although at first the latter produced but a crude dye. Those who cultivated woad opposed the introduction of indigo, and the opposition to it became so pronounced that in England and other European countries royal edicts were issued forbidding its importation. These were repealed by the middle of the 18th century. Woad is now mixed in the vats with indigo juice, but is of use chiefly as a convenient material to induce fermentation, although it is said also to improve the color itself.

Woburn, wó'bérn, Mass., city in Middlesex County; on two lines of the Boston & Maine Railroad; five miles from tidewater and 10 miles northwest of Boston. It is well laid out and has many handsome residences. The chief manufactures are leather, chemicals, machinery, glue, and foundry products. The number of employees in the leather works alone is (1904) 2,500. In 1900 (government census) Woburn had 123 manufacturing establishments, capitalized for \$2,983,705. The salaries of 50

officials and clerks, in the manufacturing works, amounted to \$65,217, and the 1,596 wage-earners received annually \$757,670. The raw material used each year cost \$3,064,985, and the value of the finished products was \$4,450,566. The water-works are owned and operated by the city. There are 12 churches; a high school, established in 1852; public and parish elementary schools, and a free public library which contains about 43,000 volumes and a fine art collection. There are three banks. The Woburn Five Cent Savings Bank has deposits amounting to nearly \$2,000,000. The government is administered under a charter of 1898 which provides for a mayor and a council of 15 members. Seven of the members of the council are elected by wards and eight at large. There is also a board of public works, the mayor is president *ex officio*.

Woburn was settled in 1640 by seven families from Charlestown Church, Mass. It was first called Charlestown Village. In 1642 the town was incorporated, and in 1889 chartered as a city. Benjamin Thompson (q.v.) (Count Rumford) was born here in 1753. Pop. (1890) 13,499; (1900) 14,254; (1910) 15,308.

GEORGE A. HOMES,

Editor 'Woburn Journal.'

Woden, wó'dén. See ODIN.

Woffington, wó'fing-tón, Margaret or Peg, British actress; b. Dublin, Ireland, 18 Oct. 1720; d. Teddington 28 March 1760. She first appeared on the stage at 12 as Polly Peacham, with several other children, in 'The Beggar's Opera,' but her first appearance in a mature part was as Ophelia in Dublin in 1737. From 17 to 20 she played on the Dublin stage all manner of parts, from Ophelia to Sir Harry Wildair, and on 6 Nov. 1740 made her first appearance at Covent Garden as Sylvia in the 'Recruiting Officer.' She soon became a great success, the exquisite art of her male characters being especially remarkable. She kept the affection of the public till the tragic close of her career. On 3 May 1757 she broke down in playing Rosalind, and left the stage forever. Her character appears to advantage in Read's novel 'Peg Woffington,' and his play 'Masks and Faces.' Consult: Molloy, 'Life and Adventures of Peg Woffington' (1884); Daly, 'Woffington: a Tribute to the Actress and the Woman' (1888).

Wofford College, located at Spartanburg, S. C. It was founded in 1851 under the control of the South Carolina Conference of the Methodist Episcopal Church, South, in accordance with the will of Benjamin Wofford, a minister of that church, who left a legacy of \$100,000 to the conference for establishing a college. It was opened to students in 1854, and the sessions have never been entirely suspended, though during the Civil War the college suffered heavily, the endowment was rendered worthless, and full college work was not done. Since that time the college has been largely supported by the church, and the endowment partially restored, amounting in 1903-4 to \$26,000. Two preparatory schools have been established in connection with the college, the Wofford College Fitting School at Spartanburg, and the Carlisle Fitting School at Bamberg, S. C. The course in the former is three years; in the latter, four years. The Carlisle school is co-edu-

ational. The college studies are arranged in four groups, or courses, the classical, the language-scientific, the scientific, and the Latin or Greek-modern language; each group includes a certain number of electives. The degree of A.B. is conferred for the completion of any of these courses, and the degree of A.M. for graduate work. Instruction in methods of teaching and in school organization is included in the curriculum. Gymnasium work is required of all students. There are five loan funds and two scholarship funds. The students maintain two literary societies, membership in one of which is compulsory; and a Christian Association which has been in existence over 20 years, and exercises an important influence on student life. The college campus comprises 70 acres; the buildings include the main building, the John B. Cleveland Science Hall, Alumni Hall, Archer Hall (a dormitory), residence cottages, the Wilbur E. Burnett gymnasium, and the fitting school. The library in 1910 contained 25,000 volumes; the students at Spartanburg numbered 273, of whom about 175 were in the college.

Wohlgenuth, völ'gè-moot, Michael, German painter: b. Nuremberg 1434; d. there 1519. He was an eminent member of the Franconia school of German painting whose completest representative is Albert Dürer. The latter was indeed his pupil in the large studio or workshop where many branches of art were carried on by the master and a host of pupils and assistants. The occupations of this artistic association comprised altar-pieces, consisting of paintings, or wood carvings in high relief ablaze with color and gilt, such as abound in Spanish churches under the name of *retablos*; wood engraving, the blocks being cut from Wohlgenuth's designs, which were of supreme vigor and well adapted to the exigencies of printing from wood and easel paintings of portraits and history. Many paintings have been attributed to him which were evidently executed by the less skillful hands of pupils or assistants, but those whose authenticity is unquestionable are characterized by powerful drawing, rich and harmonious coloring and supreme delicacy of finish. His *retable* (1465), now in the Munich Gallery, is a remarkable masterpiece, and that which he furnished for the High Altar of Saint Mary at Zwickau gained for the painter much applause and the then princely sum of about \$3,558. Another work of the same kind is to be found in Nuremberg Museum, having been originally painted for the churches of the Austin Friars at Nuremberg; his last *retable* was executed for the church at Swabach (1508). His fidelity and grace as a portrait painter are acknowledged by critics, who recognize in his realistic vigor and conscientious mastery of detail the best features of contemporaneous German painting. Two of his paintings, 'Pilate Washing His Hands Before the People' and a 'Descent from the Cross,' are in the Royal Institution Gallery at Liverpool, but few works of this master are to be found elsewhere out of Germany.

Wojwode, woi'wôd, an old Slavonic name for a general, afterward used as a title of civil rank and authority. The princes of Wallachia and Moldavia were called *wojwodes* and this name was given in Poland to the governors of the provinces, a title abolished in 1832. In Serbia and Bulgaria the title of *wojwode* still lin-

gers with its original signification of 'leader in war.'

Wolcott, wül'kô't, or Wolcott, John ('*PARR PINDAR*'), English poet: b. Doddbrooke, Devonshire, May 1738; d. London 14 Jan. 1819. He studied medicine and in 1767 went to Jamaica as physician to the governor, Sir William Tre-lawney. He then took orders in the Church of England and was a curate in Jamaica, 1769-73. After spending the next 12 years as a physician in Cornwall he went to London, where his daring poetical satires involved him in many quarrels and brought him extended fame. So effective were his attacks on King George III. that the ministry silenced him with a pension of \$1,500 per annum. He was an art critic of taste and penetration far beyond his time; his yearly reviews in verse of the Academy exhibitions are much the best of his work, and still instructive. Among his satires are: 'Lyric Odes to the Royal Academicians' (1782-6); 'Bozzy and Piozzi' (1786); 'An Epistle to the Reviewers'; 'Peeps at St. James'; 'Royal Visits'; and 'The Lousiad' (1785-95). Consult Reiterer, 'Leben und Werke Peter Pindars' (1900).

Wolcott, Edward Oliver, American lawyer and politician: b. Longmeadow, Hampden County, Mass., 26 March 1848, d. Monte Carlo, Italy, 28 Feb. 1905. In 1862 he went to Cleveland, Ohio, with his family, and during the Civil War was enlisted with the 105th Ohio regiment for a few months. He entered Yale in 1866, but did not complete his course; and was graduated from the Harvard Law School in 1871. He then went to Colorado, where he established a law office in Georgetown, Clear Creek County; in 1876 was elected district attorney for the first judicial district of the State, and before the expiration of his term cleared the docket of all criminal cases. In 1878 he was elected to the State senate, where he became the Republican leader. In 1879 he was made attorney for the Denver & Rio Grande Railroad; settled in Denver, where he built up a large private practice; and in 1884 was appointed general counsel of the same road. In 1888 he was elected to the United States Senate, and re-elected in 1894. There he was known as an earnest advocate of bimetalism; in 1896, however, he refused to support the free-silver platform of the Democratic party, continued his affiliation with the Republican party; and in 1900 was president of the National Convention. In 1897 he was chairman of a commission appointed by President McKinley to investigate the attitude of the leading European governments toward international bimetalism. In 1903 he was again a candidate for election to the United States Senate, but was defeated by H. M. Teller (q.v.).

Wolcott, Oliver, American statesman and signer of the Declaration of Independence, son of Roger Wolcott (1679-1767) (q.v.): b. Windsor, Conn., 26 Nov. 1726; d. Litchfield 1 Dec. 1797. He was graduated at Yale College in 1757 and in the same year received a captain's commission from the governor of New York, and raised a company for the defense of the northern frontier, where he remained until the peace of Aix la Chapelle. In 1751 he was appointed sheriff of Litchfield County, Conn., and in 1774 a member of the State council. He was also chief judge of the court of common pleas, a judge of the probate court, and a major-

general of militia. In 1775 he was appointed one of the commissioners of Indian affairs for the northern department, whose duty was to secure the neutrality of the Indians. In 1776 he commanded the 14 Connecticut regiments raised to act with the army in New York, and in the same year took his seat in Congress. After the Declaration was signed he returned to the army, and was present at the battle of Saratoga, but continued to serve in Congress at intervals till 1783. He was lieutenant-governor of Connecticut 1786-96, when he was elected governor, which office he held at the time of his death. Consult Sanderson, 'Biographies of the Signers' (1820-7).

Wolcott, Oliver, American politician, son of the preceding: b. Litchfield, Conn., 11 Jan. 1760; d. New York 1 June 1833. He was graduated from Yale in 1778, and for a short time served as volunteer aide to his father in the Revolutionary War. After his admission to the bar in 1781 he was for several years in the employ of the financial department of the government of Connecticut and assisted Oliver Ellsworth in 1784 in settling the accounts between his State and the United States. In 1788-9 he was comptroller of the United States public accounts, auditor of the United States treasury 1789-91, comptroller 1791-5, and secretary of the national treasury 1795-1800, in succession to Alexander Hamilton. He was a judge of the United States circuit court 1801-2, and then removed to New York and was in mercantile business there till 1812. He aided his brother Frederick in building extensive factories at Wolcottville, Conn., and was governor of Connecticut 1818-27. His later years were spent in New York. He published several political pamphlets and in 1820 his papers were edited by Gibbs with the title 'Memoirs of the Administrations of Washington and John Adams.'

Wolcott, Roger, American colonial governor: b. Windsor, Conn., 4 Jan. 1679; d. East Windsor, Conn., 17 May 1767. At 12 he was apprenticed to a weaver, but by private study secured an education, and in 1711 was appointed commissary of the Connecticut colonial forces in the attack on Canada. In the subsequent French wars he was successively promoted till he attained the rank of major-general at the siege of Louisbourg in 1745. He was governor of the colony of Connecticut 1751-4 and had previously been repeatedly member of the assembly and of the council, judge of the county court and of the superior court, and deputy governor. He published in 1725 'Poetical Meditations, Being the Improvement of Some Vacant Hours'; and wrote a poem of 1,500 lines entitled 'A Brief Account of the Agency of the Honorable John Winthrop, Esq., in the Court of King Charles II., A.D. 1662,' in which he gives a description of the Pequot war. The latter was first printed in the collections of the Massachusetts Historical Society, and the original is among the manuscripts of the Connecticut Historical Society.

Wolcott, Roger, American lawyer and governor: b. Boston 13 July 1827; d. there 21 Dec. 1900. Graduated from Harvard University in 1870 and from the law-school of the university in 1874, he was admitted in the latter year to the bar, but subsequently practised little. In 1877-9 he was a member of the common

council of Boston, and in 1880-5 of the Massachusetts house of representatives, where he gained a considerable reputation by his oratory and his activity in constructive politics and the furtherance of good government. He was sent as a delegate to the State Republican convention in 1885, in 1887-9 was again a member of the Boston common council, and in 1891 was chosen first president of the newly-organized Republican Club of Massachusetts, in which post he rendered valuable service to his party. This was recognized by his nomination as lieutenant-governor. He was elected in 1893, served by re-election until 1896, and upon the death of Gov. F. T. Greenhalge in the latter year became acting governor. In November 1896 he was elected governor by the largest plurality ever given in the State to a candidate for the office. In 1897 and 1898 he was re-elected. He declined the ambassadorship to Italy in 1899.

Wolf, wülf, Edmund Jacob, American Lutheran clergyman: b. Rebersburg, Pa., 8 Dec. 1840; d. Gettysburg, Pa., 10 Jan. 1904. He was graduated at Pennsylvania College, Gettysburg, in 1863, and served for a time in the Union army. Subsequently he studied theology at Gettysburg Theological Seminary and also at Tübingen and Erlangen, Germany, and was ordained in the Lutheran Church in 1865. He became professor of New Testament exegesis and church history at the Theological Seminary, Gettysburg, in 1874. He published: 'Lutherans in America' (1869); the 10th volume of the 'Lutheran Commentary' (1897); 'Lectures on the Gospel Lessons' (1900); etc.; and had at various times edited the 'Lutheran Quarterly' and 'Lutheran World.'

Wolf, Emma, American novelist: b. San Francisco, Cal., 15 June 1865. She was educated in the schools of her native city, and early developed a bent for authorship. She has published: 'Other Things Being Equal' (1892); 'A Prodigal in Love' (1894); 'Joy of Life' (1896); 'Heirs of Yesterday' (1900).

Wolf, völf, Ferdinand, Austrian romance scholar: b. Vienna 8 Dec. 1796; d. there 18 Feb. 1866. He studied philosophy and jurisprudence at Grätz; received a position in the Royal Library at Vienna and took an active part in the foundation of the Academy of Sciences, of which he became secretary. Among his many publications, all characterized by research and critical acumen, are: 'Collection of Modern Castilian Rhymes' (1873); 'Historical Studies of Spanish and Portuguese National Literature' (1880); 'History of Brazilian Literature' (1883); etc. With C. Hofmann he edited a collection of the oldest Spanish romances and contributed frequently to the Vienna 'Jahrbücher der Literatur.'

Wolf, Friedrich August, German classical scholar: b. Haynrode, near Nordhausen, Prussia, 15 Feb. 1759; d. Marseilles, France, 8 Aug. 1824. He was educated at the gymnasium of Nordhausen and the University of Göttingen, and in 1782 was appointed rector of the Bürgerschule at Osterode in the Harz. The next year he was called as professor of philosophy and paediatrics to Halle, where he labored upward of 20 years with the highest enthusiasm for the cause of education. In 1793 appeared his 'Prolegomena in Homerum' (3d and 4th eds., 1872 and 1875). In this he contended that

the 'Iliad' and 'Odyssey' were not the work of one man, but of several Homeric rhapsodists (wand-bearing minstrels). The work in which he tried to maintain this statement created a profound sensation and has had the effect of permanently modifying the opinions of Homeric scholars as to the manner of the composition of the 'Iliad' and 'Odyssey.' (See HOMER.) From a literary point of view his labor has been of immense service. The University of Halle was suppressed in 1807, in the storm of the French invasion, and Wolf then removed to Berlin, where he entered the ministry of public instruction, but soon resigned that he might give himself to the work of academic teaching, which disappointment and ill-health compelled him to give up in 1824 when he went south on a voyage for the sake of his health, but did not long survive his arrival at Marseilles. Wolf's great work was the invention, or at least the bringing into prominence of a new instrument of education, namely, philology, which he defined as no meagre study of the forms of language but "a knowledge of human nature as exhibited in antiquity." Locke and Rousseau had founded a school of educational theory which they considered to be more in accordance with common sense and modern needs than the classical culture of the Renaissance. Wolf revived the mental discipline and scientific aim implied in the prosecution of classical studies. Consult: Pattison, 'Friedrich August Wolf' (in the 'North British Review' for June 1865); Wolf, 'Prolegomena in Homerum' (1795); Müller, 'Homersche Vorschule' (1836); Lachmann, 'Betrachtungen über Homers Ilias' (1865); Volkmann, 'Geschichte und Kritik der Wolf'schen Prolegomena' (1874); also the Homeric writings of Gladstone, Blackie, Paley, Heyman, and Geddes.

Wolf, wulf, Henry, American engraver: b. Eckwersheim, Alsace, 3 Aug. 1852. His artistic training was completed at Strasburg, and when he came to New York, about 1875, his ability soon made itself known. He exhibited at the Paris Salon in 1888 and 1895, winning a gold medal in the latter year; and at the World's Columbian Exposition of 1893 and the Paris Expositions of 1889 and 1900. His chief works are: 'Engravings Illustrating American Artist Series' and 'Gilbert Stuart Series of Women and Men' in the 'Century Magazine.'

Wolf, wölf, Hieronymus, German classical scholar: b. Göttingen 13 Aug. 1516; d. 8 Oct. 1590. From 1557 till his death he was director of a school at Augsburg. He was one of the foremost Greek scholars of his century and is held in remembrance for his carefully annotated editions, with Latin translations, of Isocrates (1570) and Demosthenes, as well as for editions of Byzantine historians and many other classical labors.

Wolf, Rudolf, Swiss astronomer: b. Faldanden, near Zürich, 7 July 1816; d. Zürich 6 Dec. 1893. He was teacher of mathematics and physics in the realschule at Berne, 1839-55; and director of the observatory there in 1847. He was also professor of astronomy in the Bern University in 1853; professor of astronomy in the Polytechnikum and director of the observatory at Zürich in 1855, and later professor of mathematics and astronomy in the university there. He was famous for his investigations

concerning the periodicity of sun spots and the accompanying magnetic variations, and wrote extensively on the history of science, especially astronomy. His 'Astronomical Miscellany,' 1856-93, is a well-known series of papers, and his 'History of Astronomy' (1877) is a standard work of reference.

Wolf, wulf, Simon, American lawyer and communal worker: b. Hinzweiler, Bavaria, 26 Oct. 1836. A graduate of Ohio Law College, Cleveland, Ohio, in 1861, he has since resided in Washington, D. C., where he served as recorder of deeds for the District of Columbia, 1869-78. In 1881-2 he was United States minister to Egypt. While prominent in social and benevolent circles in Washington, he is identified with Jewish progress in America, was a founder of the B'nai B'rith Orphan Asylum at Atlanta, Ga., and for many years president of the Board of Delegates on Civil and Religious Rights of the Union of American Hebrew Congregations. In addition to various monographs, he has published 'The American Jew as Patriot, Soldier, and Citizen' (1898).

Wolf, a river in Wisconsin; rises in the northeastern part of the State, flows generally south, passes through Pewaugan Lake, and enters the Fox River. Wolf River has been of great benefit in the development of the lumber industry in the northeastern part of the State. It is navigable for small steamers for about 150 miles.

Wolf, a typical wild species of the dog family (*Canidae*). So closely related are wolves to the domestic and other true dogs (q.v.) that zoologists have been unable to find any satisfactory structural differences. As the distinctions are purely specific and largely founded upon the habits and character of the fur, all of the wolves are customarily placed in the extensive genus *Canis* along with the dogs and jackals. Excepting some of the domesticated varieties of dogs, wolves are the largest members of the family, and normally they howl and do not bark as do the dogs and jackals. Their natural range is throughout North America and Eurasia, but no true wolves are found in the Southern hemisphere, where they are replaced by the smaller carrion-eating jackals and fox-dogs. As they inhabit indifferently mountain-tops, plains, and swamps, and are equally at home on the frozen Arctic shores and the tropical swamps of Mexico and India, they exhibit, as might be expected, a great range of variation. Generally they increase in size, vigor, and courage northward, and the fur becomes more shaggy and thicker. The species and varieties have never been very satisfactorily discriminated and many zoologists consider that the large northern woodland wolf of both continents is a single wide-ranging variable species. Certainly these active animals are free to cross between the Old and New worlds in the winter on the ice by way of Greenland or Alaska.

The American gray or timber wolf (*C. occidentalis*) when full-grown measures 5½ feet in length, whereof 18 inches belong to the tail; its height is 33 inches, and its weight over 100 pounds. The general aspect is that of a large dog, and, indeed, the domestic dogs of the Indians were partly derived from this species and some of the European varieties from the native wolf. They are lank, long-limbed creatures with

WOLF-FISH

erect ears and drooping, rather bushy tails; the hair of the neck is generally more or less elongated and erectile. The color is very variable, the prevailing tone being gray, more or less marked with black; and becomes paler in winter and more reddish in summer. Southward the colors deepen, leading to the black wolf (*C. ater*) of Florida, the red wolf (*C. rufus*) of Texas, and the dusky wolf (*C. nubilus*) of the central plains, while in the far North the Arctic wolf (*C. albus*) is nearly pure white with a black tail-tip. The gray wolf was formerly very abundant and troublesome in most parts of North America, but has more rapidly and completely succumbed to the march of civilization here than in Europe, and long since disappeared from even the forest-clad portions of the Eastern States. At the present time wolves are practically extinct in the country east of the Mississippi River, but still roam in large packs in the Northern and Western forests and wooded swamps, and are especially large and plentiful in Newfoundland and the Hudson Bay region. Owing to their activity and restless wandering habits small parties are likely to appear in the winter at places where none have been known for years. As the habits of all large wolves are essentially similar the following account of the European wolf (*C. lupus*), which has remained much more generally plentiful and troublesome than ours, will answer for the whole group:

Wolves inhabit a great variety of country, both hill and plain, especially thick forests and broken ground, with alternate morasses and dry patches, and in the South the steppes. They shelter in woods, marshes, canebrakes, and maize fields, roaming over wide areas, often suddenly appearing where none have been seen for years, and as quickly vanishing — nor is this wonderful when it is remembered that they will cover from 25 to 40 miles in a single night. In the neighborhood of dwellings they only appear after twilight, but in secluded places carry on their hunting all day. Their food varies according to the season, consisting in summer almost exclusively of wild animals — foxes, hedgehogs, mice, birds, reptiles, and even vegetables; of larger animals, elk and deer, while hares are soon exterminated where wolves abound. While readily associating and interbreeding with large domestic dogs which have run wild they frequently attack and devour house dogs and even weak or injured members of their own species. They follow herds of lemmings in their migrations, and will devour carrion with avidity; but they do not appear to attack man unless in large numbers or pressed by hunger. Accounts of such attacks in the latter part of winter are frequent in the European press and are occasionally reported from the woods of Minnesota, Michigan, and the Canadas. In winter they approach nearer to human habitations, doing much damage to flocks of sheep and poultry. When in packs they will attack horses and cattle. In the chase the wolf exhibits all the cunning of the fox, and in addition courage and the capability of hunting in packs. These will even divide in parties, one following the trail of the quarry, the other endeavoring to intercept its retreat. In mental qualities the wolf is in every respect the equal of the fox; his caution is so great that he regards every unfamiliar object with suspicion, will not pass through a door if he can leap

over the wall, and will not, unless famished, attack a tethered animal lest it should be the bait of a trap. When he sees himself captured his courage and ferocity at once forsake him.

In spring and summer wolves are solitary or in pairs, in the autumn in families, and in winter in packs. The pairing season is in December and January, when the males fight savagely together; those who are fortunate enough to secure a mate remain with her till the young are well grown. The young are born in burrows usually excavated by the wolves themselves, and during her confinement the female is fed by the male. The period of gestation is 63 days, and from three to nine (usually four to six) cubs are found in a litter; these are blind for 21 days, and are suckled for two months, but at the end of one month are able to eat half-digested flesh disgorged by the mother. They quit the parents in November or December, but many remain together six or eight months longer; they are full grown in three years, and live from 12 to 15 years. Wolves can readily be tamed when taken young, and then exhibit many of the characteristics of domestic dogs.

Notwithstanding the spread of civilization, the wolf is still widely distributed. Excluding thickly populated regions, it extends over almost the whole of Europe; but Russia and Scandinavia are the only parts where it now occurs in any large numbers. In Asia it is spread over all the continent to the borders of India and the plains of China.

Besides the American forms already mentioned many wolves inhabiting Europe and Asia have been described as species more or less distinct from *C. lupus*. Among these are *C. niger* and *C. langifer* of Tibet, *C. pallipes* of India, *C. hodophylus* of Japan, and *C. mexicanus* of Mexico. The Indian wolf (*C. pallipes*) is smaller and slighter than the typical form, with little or no under-fur; but undoubted examples of *C. lupus* differ as much from each other as this does from them. It inhabits the plains south of the Himalayas, but is rare west of the Indus. It does not hunt in large packs, but in numbers of six or eight at most. The superstition of the people prevents its destruction, for they imagine that its blood will diminish the fertility of the fields. It is seldom heard, not howling like the European wolf. It is remarkable even among wolves for speed and endurance.

A second well-marked species of *Canis* found in North America is the prairie wolf (*C. latrans*). (See *Coyotes*.)

In Africa and South America a number of species of hunting dogs belonging to *Canis* and related genera are known locally as wolves, but the name is not properly applicable. Still less should it be applied to the "native wolf" of the Tasmanians, which is a true marsupial (*Thylacinus cynocephalus*) of carnivorous habits and canine aspect.

Consult: Mivart, 'Monograph of the Canidae' (London 1890); Merriam, 'Revision of the Coyotes,' 'Proceedings,' Biological Society of Washington (1897); Baird, 'Mammals of North America' (Washington 1899).

Wolf-fish, a large voracious sea-fish (*Anarrhichas lupus*), allied to the blenny, and named from the wolfish appearance given it by its great interlocking front teeth, and from its disposition to fight hard for its life when caught.

WOLFBOBO — WOLFF

It may attain a length of four or five feet. The color is an olive-green above, marbled with brown on the head especially. The fish feeds on echinoderms, mollusks, and crustaceans. The flesh tastes like that of cod. Several other species are known in various parts of the world constituting the family *Anarrhichidae*.

Wolfboro, N. H., town in Carroll County; on Lake Winnepesaukee, and on the Boston & Maine Railroad; about 43 miles northeast of Concord. It contains five villages. It has marble and granite works, boot and shoe factories, woolen mills, carriage and wagon works, flour mill, and lumber works. The town has five churches, graded schools, Brewster Academy, and a public library. The bank has a capital of \$50,000. Pop. (1910) 2,224.

Wolfe, wulf, Charles, Irish poet: b. Dublin 14 Dec. 1791, d. Cove of Cork (now Queens-town) 21 Feb. 1823. He was graduated at Trinity College, Dublin, in 1814, was tutor there the next year, took orders in the English Church in 1817, and was curate of Donoughmore, Ireland. The poem which has secured his fame, 'Ode on the Burial of Sir John Moore,' was published in the 'Newry Telegraph' (1817). Wolfe was also the author of several other poems, and his 'Remains,' with a 'Brief Memoir,' were published in 1825.

Wolfe, James, English general: b. Westerham, Kent, 2 Jan. 1727; d. Quebec, Canada, 13 Sept. 1759. He was educated at Westerham and Greenwich, and in 1742 received an ensign's commission in a foot regiment. In 1743 he took part in the famous battle of Dettingen; in 1744 obtained his captaincy; and in 1745-6 was present at the battles of Falkirk and Culloden. In 1747 he was wounded, though not seriously, at the battle of Lawfeldt, and from 1749 to 1757 was engaged in garrison duty in Scotland and England. In the mismanaged expedition against Rochefort (1757) Wolfe acted as quartermaster-general and the only creditable movement in the affair was a night reconnaissance conducted by him which penetrated two miles into the enemy's country. His recommendation in favor of an immediate attack, and his offer to take the place with 500 men and three ships, were unheeded; but Pitt, becoming acquainted with the facts of the case, kept the young officer in view for some future enterprise. This occurred in the following year, when Wolfe was ordered to accompany the expedition under Amherst to Cape Breton, with the rank of brigadier-general. A brilliant success was obtained in the capture of the strong fortress of Louisbourg, after a seven weeks' siege, and he became popularly known as the 'Hero of Louisbourg.' Pitt was then planning the overthrow of the French dominion in North America by the capture of their chief stronghold, Quebec, and with the instinct of genius singled out Wolfe as the most promising young officer in the army, to command the expedition, notwithstanding many older officers might by virtue of seniority have claimed the honor. Wolfe was accordingly created a major-general, and on 26 June 1759, landed his forces on the Isle of Orleans, opposite Quebec. The system of defense adopted by his adversary, Montcalm, was such as to offer no point of advantage. The season during which operations could be continued rapidly advanced, but at last having dropped down the

river, and scaled the precipitous cliffs known as the Heights of Abraham at a point insufficiently guarded, at daybreak of 13 September Wolfe found himself on the Plains of Abraham, where, his supplies thus cut off, Montcalm had no choice but to give battle. After a short struggle the French were driven from the field in complete rout; Montcalm was one of the 500 killed; the capitulation of Quebec followed five days after; and its fall decided the fate of Canada. Wolfe died in the hour of victory. In person he led the right, till thrice wounded, he was carried to the rear. He lived to hear the cry, 'They run; see how they run!' and expired with the words, 'Now God be praised, I will die in peace.' His body was taken to England and buried in Greenwich Church, and a monument was erected to him in Westminster Abbey. Consult: Wright, 'Life of Major-General James Wolfe' (1864); Parkman, 'Wolfe and Montcalm' (1892); Bradley, 'Wolfe,' in 'English Men of Action' Series (1895); Allison, 'Memoir of Wolfe' in 'Twelve English Soldiers' Series.

Wolfe, Theodore Frelinghuysen, American author: b. Kenvil, N. J., 1847. He was graduated from the medical department of Columbia in 1868, and for several years practised his profession in Jersey City, N. J. He has published: 'Literary Shrines of American Authors' (1895); 'A Literary Pilgrimage Among Haunts of British Authors' (1896); 'Literary Haunts and Homes of American Authors' (1898); 'Literary Rambles at Home and Abroad' (1900).

Wolfe Island, Canada, at the northeast end of Lake Ontario, bisects the outlet of Saint Lawrence River, and is about 18 miles long, with a maximum width of seven miles, and an area of 34,806 acres. It belongs to Frontenac County, Ontario, is the largest of the famous Thousand Islands, and is opposite Cape Vincent, New York State. Its coast is indented with picturesque bays, it is well-wooded, and the surrounding waters abound with fish. Pop. about 2,000.

Wolfenbüttel, wölffen-büt-täl, Germany, a town of Brunswick, on the Ocker, seven miles south of Brunswick. One of the ancient churches contains many of the tombs of the princes of Brunswick. The old castle now accommodates a seminary for teachers and a theatre. The library opposite, built in 1723 in the form of the Pantheon at Rome, became famous for its literary wealth, and for the fact that Lessing (q.v.) was its librarian. It was Lessing who edited the 'Wolfenbüttel Fragments,' professedly from anonymous manuscripts under his charge, but really from the pen of his friend Reimarus (q.v.), which startled the theological world of Germany. The Pantheon building had become so rickety and dangerous that it had to be taken down, being superseded in 1887 by a handsome new edifice, which houses 300,000 volumes and 10,000 manuscripts. There are in the town manufactures of machines, copper goods, flax, cloth, corks, leather, preserves, tobacco, etc. The place is very ancient, and dates from 1046; it was besieged and taken in 1190 and 1542; and during the Thirty Years' war a battle was fought here in 1641. Pop. about 20,000.

Wolff, wölf, Albert, German sculptor: b. Neustrelitz, Mecklenburg, 14 Nov. 1814; d. Ber-

lin 20 June 1832. In 1831 he entered Rauch's studio in Berlin, and in 1844 was sent to Carrara to execute the sculptures for the terraces of the Sanssouci palace. Upon his return from a sojourn in Italy of nearly two years, he assisted Rauch in the completion of the latter's Frederick the Great memorial for Berlin. In 1849 he became a member of the Berlin Academy, in 1858 professor there, and in 1866 a member of its senate. He was three times the victor in competitions for equestrian statues—in 1861 for that of King Ernest August (Hanover), in 1875 for that of King Frederick William III. (Berlin), and in 1885 for that of Gen. Artigas (Montevideo). Among his further works are busts of German notabilities, including von Moltke; a decorative bronze group, 'The Lion-tamer,' for the Berlin Museum building; colossal statues of the 'Four Evangelists' for the Schlosskirche, Neustrelitz; and other portrait and ideal productions.

Wolff, Albert, French journalist: b. Cologne, Germany, 31 Dec. 1835; d. Paris 28 Dec. 1891. He studied at the University of Bonn, settled in Paris in 1857, where he became secretary to Alexandre Dumas, Père, and in 1859 began to contribute to the 'Gaulois,' 'Figaro,' 'Charivari,' etc. Some of these articles, collected in book form, were afterward published as 'Memoirs of the Boulevard,' (1866); 'The Two Emperors' (1871); 'Victorien Sardou and Uncle Sam' (1873); etc. He wrote also several novels and farces.

Wolff, Christian, German philosopher and mathematician: b. Breslau 24 Jan. 1679; d. Halle 9 April 1754. He studied at Jena theology, mathematics, and philosophy, paying particular attention to the writings of Descartes and Tschirnhausen, and writing an elucidatory commentary on the 'Medicina Mentis' of the latter, which circumstance was the occasion of an intimacy between him and Leibnitz. In 1707 he was called to Halle as professor of mathematics. By his rationalistic views he here incurred the hostility of certain theologians who denounced him and by an order from the government of Frederick William I. he was commanded (1723) to resign his office, leave Halle in 24 hours and the Prussian States in two days. But he was ultimately vindicated and in 1740 appointed by Frederick II. vice-chancellor and professor in the University of Halle. Three years later he was made chancellor of that university. The principal service rendered by Wolff to the progress of learning consisted in his persistent application of mathematical methods to the investigations of physical science. The decided rationalism which characterized his philosophical doctrine resulted in a popularization of the Leibnitzian teaching. While appropriating many of the conceptions of Leibnitz he controverted his monadology, and regarded the theory of pre-existent harmonies as a mere hypothesis, while he asserted the possible interaction of body and soul. He followed Kant's 'Critique of Pure Reason' in dividing philosophy into Ontology, Cosmology, Rational Psychology and Natural Theology. His collected works make up 22 volumes. Consult: Amserger, 'Christian Wolff's Verhältnisse zu Leibnitz' (1897); Lewes, 'Biographical History of Philosophy'; Watsche, 'Wolffs eigene Lebensbeschreibung' (1841).

Wolff, Emil, German sculptor: b. Berlin 2 March 1802; d. Rome, Italy, 29 Sept. 1879. He was a pupil of his uncle, Gottfried Schadow, and having gained a prize at the Royal Academy of Arts, went to Italy in 1824 as a pensioner of Frederick William III., and ever after resided in Rome. He held high rank among German sculptors, and executed many Greek mythological and genre statues which have been greatly admired. In portraiture busts of Niobuhr, Thorwaldsen, Winckelmann and Bunsen are among his masterpieces.

Wolff, wülf, Ger. wölf, Joseph, Anglo-German missionary: b. Weilersbach, near Bamberg, Germany, 1795; d. Isle Brewers, Somerset, 2 May 1862. He was the son of a rabbi, but became a Christian, taught Hebrew for a time at Frankfurt and Halle, studied at Munich, Weimar, and Vienna, and in 1815 went to Rome. He entered first the Collegio Romano, and in 1817 the college of the propaganda, intending to become a missionary. Dismissed for heresy in 1818, he went to England, joined the English Church, spent two years at Cambridge, studying oriental languages, preparatory to going as a missionary to the Jews in Palestine, and in April 1821 embarked for Gibraltar. After an extensive tour in the East he returned to England in 1826. In 1827, he married Lady Georgiana Walpole, a daughter of the Earl of Orford, and in April of the same year set out on another missionary tour, and at Jerusalem was poisoned by some bigoted Jews and narrowly escaped death. On his recovery he set out for Bokhara by way of Persia and on the journey encountered the plague, was repeatedly robbed, was taken prisoner and sold as a slave, but finally reached Bokhara. He spent some time in Abyssinia, acquired the Amharic language, and returned to England in 1834. In January 1836 he again visited Abyssinia, where he was worshipped by the natives as their new aboons or patriarch, visited the Rechabites of Yemen, met a party of Wahabees in the mountains of Arabia, who horsewhipped him because they could find nothing in the Arabic Bibles he had given them about Mohammed, and in August 1837 came to New York. Here he received deacon's orders in the Protestant Episcopal Church, visited the principal cities, preached before Congress, and in January 1838 returned to England. He next visited Dublin, received priest's orders, and held several curacies in England. He went again to Bokhara in 1843 in the employ of the English government to obtain the release of Colonel Stoddart or Captain Connolly, but was imprisoned and saved from death only by the efforts of the Persian ambassador. He then returned to England in 1845 and after this eventful career spent the rest of his life in charge of the secluded parish of Isle Brewers, Somerset. He published: 'Researches and Missionary Labors among Jews and Mohammedans' (1835); 'Journal of Missionary Labors' (1839); 'A Narrative of a Mission to Bokhara' (1845); 'Travels and Adventures,' an autobiography (1860); etc.

Wolff, wölf, Julius, German poet and novelist: b. Quedlinburg, in the Harz Mountains, 16 Sept. 1834. In 1869 he founded the 'Harz News,' and in 1870-1 served in the German army and won the Iron Cross. He then settled in Berlin and devoted himself to literary work.

His chief works are: 'Aus dem Felde,' war poems (1871); 'Tyll Eulenspiegel Redivivus' (1814, 23d ed. 1896); 'The Rat-catcher of Hameln' (1876); 'The Wild Huntsman' (1877); 'Tannhauser' (1880); 'Lurlei' (1880); 'Der fahrende Schüler' (1900); while among his novels may be cited 'Der Sulfmeister' (1883); 'Der Raubgraf' (1884); 'Die Hohkönigsburg' (1902). Consult Ruhemann, 'Julius Wolff und seine Dichtungen' (1886).

Wolff, Oskar Ludwig Bernhard, German improvisator and novelist: b. Altona, 26 July 1799; d. Jena 16 Sept. 1851. He studied medicine in Berlin and subsequently history and philosophy. He became professor of modern languages at Weimar, in 1826, and of modern languages and literature at Jena, in 1832. He published: 'Pictures and Songs' (1840); 'Natural History of the German Student' (1841); 'Bubbles and Dreams' (1844); 'The Minor Ills of Human Life' (1846); 'History of the Novel' (2d ed. 1850); etc., and edited: 'Treasury of National Poetry' (4th ed. 1853); 'Treasury of German Prose' (11th ed. 1875); 'The German People's Treasury of Poetry' (28th ed. 1884); etc.

Wolfhound, a dog kept and trained for the pursuit of wolves. The ancient Irish wolfhound, now extinct, was of two kinds. One was a tall shaggy, swift-running dog, somewhat like the modern Scottish deerhound; the other more nearly resembled a mastiff, and similar dogs have been known in Spain under the name of wolf dogs. The modern Russian wolfhound is the beautiful borzoi (q.v.).

Wolframite, a native tungstate of iron and manganese in varying proportions, having the formula $(Fe,Mn)WO_4$. It occurs in flat, monoclinic crystals, with eminent cleavage parallel with the clinopinacoid. It is brittle, has a hardness of 5 to 5.5 and a specific gravity of 7.2 to 7.5, or about that of iron. It has a sub-metallic lustre, while it is almost or quite opaque and its color and streak are black or nearly black. It is thus distinguished from the closely related mineral hübnerite. It usually occurs in quartz veins, frequently associated with cassiterite or scheelite. It is of considerable commercial importance as a source of tungsten, the ferro-tungsten used in making tungsten steel being derived from it. Its best-known localities are in Bohemia, Saxony, and England, but the recent increased demand for it has brought other localities into prominence, among which are those of New South Wales, Argentina, and Connecticut. Much so-called wolframite is really hübnerite.

Wolf's-bane. See **ACONITE**.

Wolgast, vól'gást, Germany, a town of Pomerania, Prussia, on the left bank of the Peene; four and a half miles from its influx into the Baltic, and 40 miles southeast of Stralsund by rail. Its harbor is shallow, and larger vessels load and unload on the Ruden, an island at the river mouth. Wolgast has the remains of an old castle, the ancestral seat of the Dukes of Pomerania. Its industries are weaving, boat building, and the manufacture of leather and tobacco. It has also an active trade in ships' stores. Wolgast, which was strongly fortified early in the 12th century, was destroyed in 1628 by Wallenstein, in 1630 by the Swedes, in 1637 by the Im-

perialists, and in 1638 again by the Swedes. In 1675 it was taken by the Great Elector, was plundered by the Russians in 1713, and by the Swedes again in 1715. But small remains now exist of its former fortifications. Pop. about 10,000.

Wollaston, wúl'as-tón, **William Hyde**, English chemist: b. East Dereham, Norfolk, 6 Aug. 1766; d. London 22 Dec. 1828. He was educated at Cambridge and was graduated in medicine in 1793. He practised as a physician in Bury Saint Edmunds and then removed to London, where he presently devoted himself to scientific research, becoming secretary of the Royal Society in 1806, and its president in 1820. He was the inventor of the goniometer, an instrument for measuring the angles of crystals, and the discoverer of palladium and rhodium, in 1803, and the malleability of platinum, for which latter discovery he received the medal of the Royal Society in 1820 and which brought him \$150,000.

Wollaston Lake, Canada, a lake of Athabasca, in the Northwest Territory. It is about 50 miles long and has its outlet in the Mackenzie River.

Wollaston Land, Canada, a region of Franklin territory, lying west of Victoria Land, in the Arctic Ocean.

Wollastonite, one of the pyroxene group of minerals, crystallizing, therefore, in the monoclinic system. Its crystals are usually tabular, to which fact its name "tabular spar" is due. Crystals are, however, rather rare, the common occurrences being compact or in aggregates of brittle fibres, having a splintery fracture. Its hardness is 4.5 to 5, and specific gravity 2.85. Its lustre is vitreous to pearly and its usual color is white or gray. Some localities yield specimens which show excellent triboluminescence. It is a calcium metasilicate, $CaSiO_3$. Its most important American localities are in northern New York. It was named in honor of the eminent English chemist, W. H. Wollaston.

Wollin, vól'lén', Germany, an island of Prussia at the mouth of the Oder; on the north side of the Great Haff; length, 20 miles; breadth from 3 to 10 miles. Fishing and cattle-rearing are the chief occupations. Pop. 14,000.

Wollastoncraft, wúl'stón-kraft, Mary. See **GODWIN**, MARY **WOLLSTONCRAFT**.

Wolseley, wúlz'li, Sir **Garnet Joseph**, 1st Viscount, British soldier: b. near Dublin 4 June 1833. He entered the army in 1852 as an ensign, served in the Burmese war of 1852-3, went through the Crimean campaign and was severely wounded before Sebastopol. For his services here he was made a member of the Legion of Honor, and in 1855 was advanced to the rank of captain. He saw active service in India during the Mutiny, from 1858 to 1860 was attached to the Bengal command, and took part in the brief China war of 1860, and in 1865 attained the rank of colonel. He was assistant quartermaster-general and deputy quartermaster-general in Canada 1867-70, and in the latter year led the successful Red River expedition against Louis Riel. On leaving Canada he received the appointment of assistant adjutant-general at headquarters, a post which he held till 1873. In the Ashanti war in 1873-4 his admirably planned march resulted in the capture of Kumasi, the

native capital, and led to the securing of British authority on the Gold Coast. In 1873 he went to Natal as imperial commissioner, in 1878 was promoted to the rank of lieutenant-general, and went to Cyprus in the capacity of high commissioner and commander-in-chief. Leaving Cyprus next year he was again sent to South Africa, this time as governor and high commissioner of Natal and the Transvaal in order to finish the Zulu war and check the advance of Secocoeni. On returning home in 1880 he was appointed quartermaster-general of the army, a post which he held till 1882, when he was advanced to the rank of general, and as commander-in-chief conducted the campaign in Egypt against Arabi Pasha, which ended in the utter defeat of the latter at Tel-el-Kebir. For this he was raised to the peerage as Baron Wolsey of Cairo and of Wolsey, in the county of Stafford. He commanded the Nile expedition of 1884-5, which was sent too late to relieve General Gordon in Khartum, and on his return was created Viscount Wolsey of Wolsey, and made a Knight of the Order of St. Patrick. In 1890 he was appointed to the command of the forces in Ireland, becoming at the same time privy-councillor of Ireland, and in 1895 succeeded the Duke of Cambridge in the post of commander-in-chief in the United Kingdom. He was succeeded in the latter post by Lord Roberts, on his return from South Africa in 1900. He has published: 'Narrative of the War with China in 1860' (1862); 'The Soldier's Pocket-Book for Field Service' (1869); 'The Life of John Churchill, Duke of Marlborough, to the Accession of Queen Anne' (1804); 'The Decline and Fall of Napoleon' (1805). Consult Low, 'Memoir of Sir Joseph Garnet Wolsey' (1878).

Wolsey, wul'si, Thomas, English statesman and cardinal: b. Ipswich, Suffolk, March 1471; d. Leicester 29 Nov. 1530. He was the son of a butcher and was sent to Magdalen College, Oxford, of which he became a bachelor at 15, and was elected fellow. Being appointed master of a grammar-school dependent on the college, he had three sons of the Marquis of Dorset under his care, which led that nobleman to present him to the living of Limington, in Somerset. He was afterward chaplain to the archbishop of Canterbury, then to one of the governors of Calais, and finally was recommended to Henry VII., who made him one of his own chaplains. Under Henry VIII. his progress in advancement was very rapid. In 1509 he was made dean of Lincoln; in 1510 became rector of Torrington; in 1511, canon of Windsor, registrar of the order of the Garter, and privy councillor; in 1513, dean of York and bishop of Tournay (being then in France); in 1514, bishop of Lincoln and then archbishop of York. In 1515 Pope Leo X. elevated him to the dignity of cardinal, and in the end of the same year Henry made him lord-chancellor. His nomination in 1518 to be the Pope's legate *à latere*, completed his ecclesiastical dignities, by exalting him above the Archbishop of Canterbury. At the time when the rivalry between the Emperor Charles V. and Francis I. rendered the friendship of Henry of great importance Wolsey was treated with the greatest respect by both sovereigns, receiving pensions from each, as well as a third from the Pope. He ultimately, however, favored the side of Charles,

who settled upon him the revenues of two bishoprics in Spain, and flattered him with hopes of the Papal chair, which induced him to involve Henry in a war with France. Insatiable in the pursuit of ecclesiastical emolument, in 1519 he gained the administration of the see of Bath and Wells, and the temporalities of the abbey of St. Albans, his revenues now nearly equaling those of the crown. Part of them he expended in pomp and ostentation, and part in laudable munificence for the advancement of learning. His love of splendor was signally displayed on the Field of the Cloth of Gold in June 1520; his love of learning in his foundation of several lectures, as well as the college of Christ Church at Oxford, and of a collegiate school at Ipswich. He built a palace for himself at Hampton Court, but this he in the end presented to the king. In 1522, on the death of Leo X., and again in 1523, on the death of Adrian VI., he failed to secure elevation to the papacy, and on both occasions attributed his failure to Charles V., to whom he ever afterward entertained a strong aversion. The critical affair of the divorce of Queen Catharine was one of the first steps to his fall. With Cardinal Campeggio he was appointed to determine the legitimacy of Henry's marriage with her, and lost the favor of the king by exposing himself to the suspicion of causing delays in the settlement of the question. He fell still more into disfavor by advising the king against marrying Anne Boleyn, and of course roused the hostility of Anne herself and her friends. Leading nobles deeming this a good occasion for contriving his ruin, caused him to be accused of having in the exercise of his duties of papal legate violated the statute of *præmunire* (1529), and he was convicted. The Dukes of Norfolk and Suffolk were sent to require the great seal from him, he was ordered to quit York Place, his palace in London, and retire to Esher, in the diocese of Winchester, and his lands, goods, and chattels were declared forfeited. Henry still assured him of his protection. Part of his revenues were restored to him, and he was even reinstated in the diocese of York. But Henry did not continue his protection long. Toward the close of the year 1530 he was arrested at his mansion of Cawood, in the diocese of York, whither he had retired, and was ordered to be conveyed to London on a charge of high treason. Illness and mental distress obliged him to stop at Leicester, where he was well received at the abbey and where he died a few days after. Shortly before his death he is said to have exclaimed to the officer appointed to conduct him, "Had I but served God as diligently as I have served my king, he would not have given me over in my gray hairs." There has been considerable disposition in later writers to vindicate the character of this minister; and it must not be forgotten that, in the reign of Henry VIII., who had broken his heart; of Mary, the daughter of the much-injured Catharine; and of Elizabeth, whose mother (Anne Boleyn) was the chief instrument of his downfall, scant justice could be expected to be rendered to the better traits of his mixed character. If he was loose in his morals, grasping in his ambition, and rapacious, he was liberal and even profuse toward his dependents, and in his patronage of letters. He was enlightened far beyond the period in which he lived. As a diplomatist it is

WOLVERHAMPTON—WOMAN'S SUFFRAGE

very difficult to say whether his abilities or industry were the most remarkable, and it is to him that England is indebted for the first notion of a vigorous police, and for a regular system in the administration of justice. Consult: 'Life' by Cavendish (1641); and 'Lives' by G. Howard (1824); C. Martin (1862); Williams, 'Lives of the English Cardinals' (1868); Brewer, 'Reign of Henry VIII.' (1884); Creighton, 'Cardinal Wolsey' (1888); Gasquet, 'The Eve of the Reformation' (1892); Gairdner, 'The Fall of Cardinal Wolsey' in 'Transactions of the Royal Historical Society' (1899); Taunton, 'Cardinal Wolsey' (1900); and Gairdner's article in the 'Dictionary of National Biography.'

Wolverhampton, wul-ver-hämp'ton, England, a manufacturing town, the "metropolis of the Black Country," is built on an eminence amid a network of railways and canals, 13 miles northwest of Birmingham, and 126 northwest of London. The town stands on the western edge of the great coal and iron mining district of South Staffordshire, so that the vicinity on the south and east is covered with collieries, ironstone mines, blast furnaces, forges, iron foundries, and rolling mills, while on the north and west there is pleasant green country. It was first called "Hamton," and then "Wulfrun-ismhamton," after Wulfruna, King Edgar's sister, had founded in 996 St. Peter's Church, which continued collegiate till 1846. Rebuilt during the 13th, 14th, and 15th centuries, and enlarged and elaborately restored. The church is a fine cruciform Gothic edifice, with several notable features and monuments. The other public buildings are all modern and include the town-hall, corn exchange, market-hall, agricultural hall, hospital, post-office, art gallery, drill-hall, etc. The free grammar-school, founded in 1512, occupies handsome new buildings of 1876; and there are also a blue-coat school (1710) and an orphanage (1850). In 1757 Wolverhampton was described as "a great manufacturing town in all sorts of toys, and particularly of locks in the greatest perfection; locks—some 2,000,000 yearly—are still its specialty. The other manufactures include tin plate, japanned goods, enameled hollow wares, edge tools, gas and water tubes, electro-plate, papier-maché, chemicals, etc. Pop. about 99,000.

Wolverine, Glutton, or Carcajou, a carnivorous mammal (*Gulo luscus*), of the weasel family (*mustelida*), but differing greatly in appearance from the light and slender weasels typical of that family. The wolverine is a short, thick, heavily built animal about 2½ feet long, whose short legs, sub-plantigrade feet, and short, bushy tail add to a decidedly bear-like aspect of body. On the body and especially on the tail the hair is long, coarse, and rough, blackish-brown with a pair of yellowish lateral bands meeting at the root of the tail above. The teeth are 38 in number and the molars are remarkable for their massiveness. The wolverine is a northern animal entering the United States only along the Canadian border, and even there very rare.

Apparently there is no distinction between the glutton of northern Europe and Asia and the American wolverine, and in both Old and New Worlds this brute is alike hated by woodsmen and trappers for its voracity, native meanness,

and cunning. It has the reputation of being the most powerful mammal of its size in existence, and in dogged courage is said to have no equal. Those who have had experience with it place it ahead of even the coyote in craftiness and the ingenuity which it exhibits in finding and robbing the stores of man and beast. It systematically follows the lines of traps set by fur hunters and robs them of both baits and captured animals; but is itself one of the most difficult of animals to take, and succeeds in repeatedly springing and robbing traps set for it, even when most cunningly concealed. Nor is its thieving confined to things edible; sometimes every portable article in a camp equipment will be carried away and hidden by a wolverine. It devours enormous quantities of food and its European name indicates that it is the type of greedy voracity. It lives on hares, squirrels, beavers, mice, foxes, all kinds of ground birds and their eggs, reptiles, insects, and even such large game as reindeer, which it is enabled to secure by its perseverance, great strength, and cunning. An expert tree-climber, the wolverine finds its most congenial home in the great northern forests, but its range extends beyond the tree line to the Arctic shores. Early spring is the mating season, and four or five young are born in June or July in a nest at the bottom of a burrow. The savage courage with which the female will defend her young is almost proverbial among trappers, who dread few animals so much as a mother wolverine with her family. Consult Coues, 'Fur-bearing Animals' (Washington 1877).

Wolverine State, a popular name for the State of Michigan, so called for its abounding in early days with wolverines.

Woman, Education of. See EDUCATION OF WOMEN.

Woman's Suffrage. The basic arguments for woman's suffrage, now an increasingly important factor both in this country and Europe, are three:

First. The natural rights of woman—that woman have as clear a title to the ballot as men have. It is claimed that women are governed, but without their consent.

Second. The need of woman's influence in politics to protect her own sex and to purify political action. Women cannot be adequately protected while men alone make the laws, either in business interests or in certain social and domestic rights that are now denied them. Her votes, it is also claimed, are needed in the interest of better government.

Third. The good results of woman's suffrage where already tried.

It is too early to state that the results prove all that is claimed for them, for analyses are not by any means complete; but there is no question about the progress of the movement and its constant invasion of new territory. It is perhaps attracting more attention in England than in America because of the "militant" character; but in this country the advance made, if more unobtrusive, is perhaps more real. A few figures may indicate something of the state of the movement in 1912.

Six States now grant suffrage to women on equal terms with men—Wyoming since 1869; Colorado since 1893; Utah and Idaho since 1896;

WOMAN'S CHRISTIAN TEMPERANCE UNION—WOMB

Washington 1910; and California 1912. Oregon, Nevada, Wisconsin and Kansas have agreed to submit the question to a vote of the people. School suffrage for women prevails in some form in 30 States. In several other States limited suffrage has been granted.

In Great Britain women can vote for all officers except members of Parliament. In Australia and New Zealand, the Isle of Man and Iceland women have full suffrage; in Norway they have tax-paying parliamentary suffrage; they have secured municipal suffrage in Denmark, Spain and many parts of Canada; in France and Cape Colony there are limited voting privileges for women.

Quite as significant is the changed attitude of the press as well as the mass of public opinion. There was no mistaking the respect with which the parade in New York on 4 May 1912 was treated nor the favorable impression which it made—"a sight which cannot but thrill the people of all other countries quite as much as it does Americans," remarked a great daily, and then it goes on to say, "If we are really to make genuine effort to wipe out special privilege, why not begin by giving votes to women and putting an end to the special privilege of votes for men only?" And the *New York Independent* adds, "It must now be apparent to all that this movement for liberty, equality and sorority will not end until all the women are enfranchised."

It is only fair to add that not all women by any means, are in favor of woman's suffrage, and in many States, including New York, Pennsylvania and Massachusetts, there are strong Anti-Suffrage Leagues.

Woman's Christian Temperance Union, a reform organization founded at Cleveland, Ohio, in 1874; it was the outcome of a woman's crusade against the liquor traffic in the Middle States from 1870 to 1873. In 1910 the "W. C. T. U.," as the organization is popularly called, had regular associations in every State and Territory, with over 10,000 local unions and a total membership of 600,000. An international association was founded in 1883 largely through the efforts of Frances E. Willard, and now has auxiliaries in 40 countries and provinces. The headquarters of the American association are at Evanston, Ill. The white ribbon is the general badge of the organization. The union has upward of 50 distinct departments of work, presided over by women experts in various lines. All the States except one have laws requiring the study of scientific temperance in the public schools, and all these laws were secured by the Woman's Christian Temperance Union; also the laws forbidding the sale of tobacco to minors. The first police matrons and most industrial homes for girls were secured through the efforts of this society, as were the refuges for erring women. Laws raising the age of consent and providing for better protection for women and girls have been enacted by many legislatures through the influence of the department for the promotion of social purity. See also TEMPERANCE; TEMPERANCE SOCIETIES.

Woman's College of Baltimore. This institution, situated in Baltimore, Md., was founded in 1884 by the Baltimore Conference of the Methodist Episcopal Church, as a memorial

of the centennial of the organization of that Church in the city of Baltimore, December 1784. The Board of Trustees was incorporated in January 1885 with the Rev. Bishop Edward G. Andrews as president. In April 1890 the charter was amended and the powers of the corporation were enlarged. Building was begun immediately after incorporation and the doors were opened to students in September 1898, under the presidency of William H. Hopkins, Ph.D. In 1890 Dr. Hopkins resigned the presidency to take the chair of Latin, and the Rev. John Franklin Goucher, LL.D., was made president. President Goucher, in addition to his services to the institution, has been a large benefactor. The principal building, named Goucher Hall, was his gift, and his total contribution amounts to nearly half a million.

The estimated value of the grounds, buildings, equipment and endowments is about a million and a half of dollars. Two buildings, one for instruction and one for residence, have been assigned to the use of the Girls' Latin School of Baltimore, which is preparatory to the College.

The college is organized with the usual departments. Direction and discipline are in the hands of a Board of Control composed of the heads of departments. The standards of entrance are represented by a high-school course of four years, containing Latin, German or French, English, rhetoric, composition and literature, history, algebra, plane geometry and a science with adequate laboratory facilities. The course of study is usually taken in four years. About one third of the work is required, the remainder is elective in groups. Graduation is conditioned upon the completion of sixty year-hours, whatever the elective group, and the degree of Bachelor of Arts is the only first degree bestowed. The degree of Master of Arts is bestowed upon the completion of additional studies demanding a year in residence or three years in absentia with yearly examinations. Marked attention is given to the hygienic and physical training of the students and the health record of the college has attracted attention. Discipline is liberal, interfering with freedom of the students only in so far as may seem necessary for the maintenance of institutional routine, the forming of healthful habits, the securing of conditions favorable for study and the furnishing of moral safeguards.

JOHN B. VAN MEYER,
Dean of the College.

Woman's Relief Corps, an organization created by the mothers, wives, daughters, and sisters of Union soldiers of the Civil War of 1861-5, for the purpose of aiding and assisting the Grand Army of the Republic, and to "perpetuate the memory of their heroic dead," to "extend needful aid to the widows and orphans," to "cherish and emulate the deeds of our army nurses." In 1910 there were 2,882 corps and 164,255 members.

Womb, The, and its Diseases. The womb or uterus is one of the generative organs of the female. In its cavity the impregnated ovum is received, retained, and supported during the development of the fetus, and from this cavity the child is expelled at the time of parturition. In the virgin, the womb is pear-shaped, flattened from before backward, and is

WOMBAT—WOMEN IN THE INDUSTRIES

about 3 inches in length. It is divided into body and neck. The fundus or upper extremity of the body is broad and convex, and is directed forward. From this portion the body gradually narrows to the neck, the lower rounded and constricted portion of the womb, which is directed downward and backward in the line of the axis of the inlet of the pelvis, and around its circumference is attached to the upper end of the vagina.

The womb is situated in the cavity of the pelvis, between the bladder and the rectum, and is retained in position by ligaments, which in a normal condition of the parts also allow free movements of the womb during respiration, muscular exercise, and change of posture. The ligaments are the two lateral or broad ligaments which pass from the sides of the womb to the lateral walls of the pelvis; the two round ligaments which are attached at the upper angles of the womb, one on each side, and pass out through the internal abdominal rings to end in the labia majora; the two anterior ligaments or folds of peritonæum between the neck of the womb and the bladder; and the two posterior ligaments or folds between the womb and the rectum. The womb is a muscular organ, consisting of bundles of unstriped muscular fibres, arranged in layers intermixed with areolar tissue, blood-vessels, lymphatics, and nerves. A serous coat derived from the peritonæum covers the posterior surface of the body of the womb and the upper three fourths of its anterior surface. The cavity of the womb is triangular and flattened from before backward, its base being toward the fundus, and is lined with mucous membrane, having ciliated epithelium at its upper portion. This mucous coat contains the uterine glands, and is continuous with the mucous membrane lining the vagina, and connects with the peritonæum through the orifices of the Fallopian tubes or oviducts, one orifice at each superior angle of the uterine cavity. The two Fallopian tubes (q.v.) are appendages of the uterus attached to its superior angles, and convey the ova from the ovaries (attached to the broad ligaments) to the cavity of the womb. At the inferior angle of this cavity is a small constricted opening, the internal orifice, which leads into the cavity of the cervix. At the vaginal extremity of the uterus is a transverse aperture, the os uteri or external orifice.

The womb is subject to cancerous, fibroid, fibrous, and cystic tumors and polyps, to inflammatory affections of the mucous lining and the parenchyma, such as endometritis and metritis of the neck or body of the uterus; to ulceration of the os and cervix uteri, and to displacement (prolapse or falling of the womb), versions, and flexions. The causes of endometritis are direct injuries (as from pessaries, chemical irritants, etc.), inflammation of the vagina, interference with the menstrual flow, etc.; of metritis, mechanical and other injuries, sudden suppression of the menstrual flow, endometritis, and morbid growths. Ulceration is usually a complication of endometritis. Among the causes are uterine displacements causing friction against the cervix, abuse of sexual intercourse, vaginal or uterine leucorrhœa, the use of pessaries, and injuries in parturition. Displacements of the uterus are quite common, and among their

causes are: (1) increase in weight of the uterus from inflammation or congestion, tumors, pregnancy, fluid retained in the cavity, etc.; (2) weakening of the uterine supports from rupture of the perinæum, loss of tone of vaginal walls, laxity of uterine ligaments, and degeneration of uterine tissue; (3) influences pressing the uterus out of place, such as tight clothing at the waist, the weight of heavy clothing on the abdomen, muscular efforts, such as lifting and straining, abdominal tumors, distended bladder, etc.; (4) traction on the uterus, from deposits of lymph in pelvic areolar tissue, cicatrices in vaginal walls, shortening of uterine ligaments, etc. Flexions of the uterus are bendings of it forward, backward, or to either side, known as anteversion, retroversion, etc. A prolapse is a falling or descent of the uterus into the pelvic cavity, or the prolapsed organ may protrude from the body at the vulvar orifice. The first form is known as incomplete prolapse, the latter as complete prolapse. The symptoms of uterine diseases include leucorrhœa, pain in the small of the back, dragging sensations, a feeling of weight and heaviness, interference with the functions of the bladder and rectum, dyspepsia, and despondency. See **EMBYOLOGY; MENSTRUATION; ONSTETICS; OVARY.**

Wombat, a burrowing marsupial of the phalanger family and genus *Phascologomya*, natives of Australia and Tasmania. The species most commonly known (*P. wombat*) is 2 to 3 feet long, with a very short tail, clumsy form, stout limbs, blunt muzzle and rough hair of variable tint. In their general form and actions the wombats resemble small bears, having a similar shuffling plantigrade walk; but they are even shorter in the legs and broader in the back than those animals. The dentition resembles that of rodents. They live on the ground and in burrows or holes among rocks, feeding on roots, grass, and other vegetable substances. They sleep in the day, seeking their food at night, and are usually gentle in their habits, though their large chisel-like incisors enable them to bite strongly if provoked. Wombats exhibit small intelligence, but are gentle, and capable of domestication to a limited extent. They are hunted for their flesh, which is highly esteemed, and is said to resemble pork.

Several species exist, besides the one above mentioned. *P. ursinus* is brownish gray, like the third species, the hairy-nosed wombat (*P. latifrons*), which differs from the other two in having smooth silky fur, a hairy muzzle, and large pointed ears. It inhabits southern Australia. The largest living wombat (*P. mitchelli*) is about three feet long, but remains of a large extinct genus (*Phascolonius*), which must have been nearly as large as a tapir, have been found in Queensland. Consult authorities mentioned under **MARSUPIALS**.

Wombwell, woom'wél, England, a town in the West Riding of Yorkshire, about five miles southeast of Barnsley, with extensive coal mines in the neighborhood.

Women in the Industries and Professions. In the United States the proportion of the women of the country who engage in gainful occupations has increased enormously in the last decade and is still largely on the increase. This percentage differs in the various States; in New England it rises almost to 30 per cent, while in the West it

WOMEN IN THE INDUSTRIES

is only from 10 to 15 per cent. These figures include all gainful occupations, from household and factory work to the higher professions.

According to the census of 1900, 1,031,760 women and 4,121,006 men were employed in manufacturing trades in the United States.

The increased facilities for women's professional training and the natural ambition and independence of the American woman have lured more and more women of intelligence into the higher branches of work. In commercial pursuits, such as clerking and stenography, over 500,000 women are employed; in industrial pursuits, 1,300,000; in the servant class, 2,095,000, and in agricultural work about 1,000,000. Of these last, a large proportion are negroes in the Southern States, working in the cotton fields. Under the heading of servants are included about 100,000 women who work in laundries.

Women in professional life hold a better position in the United States than in any other country. They are recognized in the various professions and stand, in cases where they have done good work, often on a level with men. Women lawyers plead in court with the same rights as men, and some few women lawyers have argued cases before Courts of Appeal. Women physicians are accorded the same rights as men, and are called in consultation and admitted as equals in surgical cases. In New York City one woman upheld her right to acquire the experience to be gained by doing ambulance duty and gained her point, that she had the same right as men to do such work. Women librarians are many and highly appreciated, and some few women preachers have been successful.

Among teachers many more women than men is the rule all over the world. Men receive higher pay than women for teaching, as a rule, but usually this is for what is considered a higher grade of work or a more difficult kind of teaching. Women principals receive the same pay as men in the same positions. On the whole the rule of "equal pay for equal work" is not considered to have been as yet fairly applied to the teacher's profession, however. The fact that men more often have some one besides themselves to support, and that the opposite is most frequently true of women, is apparently the main cause of this seeming injustice.

The professional women are to a great extent located in the large cities, as naturally are also those engaged in commercial pursuits. The industrial trades are mostly concentrated in Massachusetts, Connecticut, New York, New Jersey, Ohio, and Illinois, while there are some large cotton factories in the South. The agricultural women workers are scattered all through the country, but many of them are located, as above stated, in the South.

The average age at which girls go to work, including in the census all branches, is fourteen years. In parts of the South, children are still employed in mills, which keeps the average age low. The average age of working women in this country is twenty-two years. Of the great army of women workers, about two-thirds are under twenty-five years of age and one-half are under twenty-one years. Taking a census of all professions and industries, two-thirds of the women are single and one-third are married.

The proportion of married and single women in different branches of work varies greatly.

In the servant class, 79 per cent are single.

In manufacturing and mechanical work, 78 per cent are single.

Among dressmakers (of whom there are nearly 350,000), 69 per cent are single.

In commercial branches, 90 per cent are single.

In the professions, 87 per cent are single.

Young girls are employed in the following occupations, the proportion of girls under sixteen years being given:

Knitting mills	18 per cent
Silk mills	18 per cent
Paper box-making	16 per cent
Confectionery	15 per cent
Sweet shops	21 per cent
Shirts, collars, and cuffs	10 per cent

In all the textile trades the percentage of women employed varies from 49 per cent to 73 per cent in the different mills.

Bookbinders	52 per cent are women
Glove makers	65 per cent are women
Tobacco workers	67 per cent are women
Cornet makers	80 per cent are women
Artificial flower makers	84 per cent are women
Paper-box makers	86 per cent are women
Lace and embroidery makers ..	79 per cent are women
Shirt, collar, and cuff makers ..	74 per cent are women

The average wages for women over sixteen in the various trades and industries are from \$4 to \$6 a week while working, but in all trades there are slack seasons of varying length. The lowest wages seem to be paid to the tobacco and candy workers, while workers in rubber have a medium wage of \$7. This is according to the census of 1900.

In almost all cases it is found that for the same work women receive smaller pay than men do. The reasons for this are given by writers on economics, who have made a careful study of the subject, as "Because women cannot work so hard nor so well," "Because women can live on less than men can," and "Because it is more difficult for women to get wage-work, so they must take what work and what money they can get." One writer says that "Women do not on the average work so hard nor so well as men, so that if wages were paid with sole reference to quantity and quality of the product of labor women would get less. This inferiority in the net efficiency of women's labor is partly due to physical, partly to social causes." The result of careful investigation is the opinion—or conviction—that the work of women, in all trades where strength counts, is inferior, while there are some few branches of textile work and book-binding and, of course, other trades, such as dressmaking and millinery, in which the superior dexterity and finger-skill of the woman more than balance the inferiority in strength. In his book on "America's Working People," Charles Spahr speaks of mills in New England where women were preferred to men because of this dexterity, and for that reason the men were obliged to do the home work of the family—a condition he much deploras.

Hobson, in "The Evolution of Modern Capitalism," speaking of the textile trades in England—and, naturally, the same conclusions will apply to women in all countries—says: "Even when we take those kinds of work where skill seems least dependent upon physical force, men have generally some advantage in productivity, though a smaller one. There are cases in which this does not seem to be the case, as in the weav-

WOMEN IN THE INDUSTRIES

ing industries of Lancashire and part of Yorkshire, where women not merely receive the same piece wages, but earn weekly wages, which, after making allowances for sickness and irregularity, indicate that in quantity and quality of work they are upon a level with men.⁹

These, however, are not considered by students of the subject the sole causes of the comparative inefficiency of women. That "making allowances" quoted above is one key to the situation. That women do not, as a rule, go into their work with the same strength of purpose as men; that they are much more liable—the factory class of women, at least—to allow minor physical or social causes to make them irregular; that they more often than otherwise consider their work merely as a temporary bridge over hard times or the period of waiting until marriage makes it unnecessary,—these causes militate greatly against them as a class.

A large proportion of women in the industrial class marry young and are only working temporarily. In cases where conditions are different—in the professions or even in trades where careful training is necessary, where there is more room for pride in the work—the standard of efficiency among women is higher and there is a much nearer approach to equal pay for equal work. In America especially this is true, for, while the American young woman is not in any way averse to marriage, she does not to so great an extent consider it the aim and end of life as do her foreign cousins. More independence of spirit, fostered by the essentially American belief in the equality of the sexes, has given the average American girl the desire to be able, if necessary, to take care of herself.

More girls are trained to a profession, or at least to some possible means of livelihood, than was ever before the case. The woman who, when misfortune came, settled down to a dependent existence, looking to some male relative for support, is a thing of the past.

Statistics prove that women are more often absent from work owing to sickness and home demands than are men. That the former disadvantage under which their labor may be removed by physical training and proper exercise and by a higher standard of diet is the belief of physical culturists, and that the latter is merely a voluntary disadvantage in most cases is quite sure.

The average age at which women in the industrial class marry in America is twenty-two years, and many marry at twenty and twenty-one years, or even younger. With this prospect of early marriage the average woman has no interest in organization. It does not seem worth while to her to organize and make herself subject to union rules. Strikes might put her out of work for much of the short period of her life that she is planning to give to wage-work. This idea of matrimony in the scheme of life is, in some classes, so strong a factor that the girls choose their occupations with an eye to it. The opportunities of meeting young men and the social standing of the different trades or occupations count for much. Clerks in shops are considered most fortunate as to position, factory workers next (with certain manufacturers standing higher than others, this being usually determined by the rate of wages paid), and domestic labor lowest.

The large number of women workers in America is said by students to be due to the increased cost of necessities and the greater de-

mand for luxury in the scale of living—better homes, better clothing, better social opportunities. This increased demand gives work in the production of the articles demanded. But, on the other hand, the desire for luxuries and the rush to obtain them have their bad effect and do not show a tendency to improve the industrial position of women.

In 'The Evolution of Modern Capitalism' the author says that causes which may lead to increased employment and better pay for women are the growth of restrictions about hours, etc., imposed by the men's unions; the evolution of machinery suited to women's handling; the breakdown of prejudices excluding women from many occupations; improved transportation facilities, enabling women to take work at greater distances from home; the recognition by a growing number of women that matrimony is not the only career open to them, and that industry is more dignified than waiting.

On the other hand, women as a rule have only themselves to support. They need little, and in the stress of competition they take less wages than they should, because they need less than men. This keeps down the level of wages. "Women living at home will often work for a few shillings a week to spend in dress and amusements, utterly regardless of the fact that they may thus be setting the wage below the starvation point for those unfortunate competitors who are wholly dependent on their earnings for a living." This is said of English workers, and the same cause is working even more forcibly, perhaps, in the United States. Mrs. Van Vorst, in 'The Woman Who Toils,' claims to have found "a large proportion of girls working in factories who work merely for pin-money, or money for luxuries of dress and amusements." She says: "The men were all bread-winners; they worked because they needed the money to live; they supported entirely the woman—wife or mother—of the household who did not work. In many cases they contributed to the support of even the wage-earning females of the family; the woman who does not work when she does not need to work is provided for."

It is this writer's conclusion that there are two distinct classes of working women—those who must be self-supporting and those who work in factories in order to be more independent than at home, to meet the men and to amuse themselves and have money for dress.

In a report of a special committee appointed in New York to inquire into the condition of 100,000 families who were, in each instance, dependent on a woman's average earnings of sixty cents a day, it was stated that "the prevailing low wage, inadequate to the support of labor, is due to the fact that in the establishments employing woman labor, a great majority of the workers are only partly dependent on their earnings for a livelihood." Mrs. F. McD. Thompson, in commenting on this report, says: "So large a number as 100,000 women, by accident laboring under the necessity of earning a livelihood, were still outnumbered and had their wages fixed by the normal woman—the woman wholly or in part supported by others."

"The only industrial unit complicating the problem," Mrs. Van Vorst says, "is the girl who confessedly has all the money she needs but not all she wants."

These girls can afford to accept less than liv-

WOMEN IN THE INDUSTRIES

ing wages, and because of their independence can afford to stay away from work because of slight indisposition or a desire for amusement. Thus they give women as a class the reputation of being irregular and undependable.

Mrs. Van Vorst, as a method of removing this stumbling block from the path of the real worker, suggests the formation of classes in the industrial arts, where women who wish to work although they do not need the money may be taught. Thus their minds and tastes may be improved and at the same time they may be earning some money through the salability of their work. Lace-making, hand-weaving, embroidery, book-binding by hand, wood-carving, and such industries may be taught, and the work be carried on in their homes by the graduates of such classes, thus giving them occupation without competition with men or interference with the women who must work for living wages.

Such classes already exist at the Simmons School in Boston, and at Columbia University in New York, and Hull House in Chicago, and others are forming. Abroad, many women of wealth and influence, even royal women, have founded schools for such work among women. The lace-making schools especially are famous. All through the United States there has been, partially along this line of thought, a great revival of cottage industries. Men and women of means and artistic ability are fostering the revival of the old-time hand industries such as dyeing, hand-weaving of cloth, rug and carpet-making, basket-making, etc. Societies for increasing the knowledge of the often isolated home-workers and for encouraging them in improving their output, and also for the purpose of bringing them into touch with a market for their wares, have been started in all sections of the country, but noticeably in New England and through the mountain regions of the Southern States. Thus by those who appreciated the value of the hand-work which had so largely fallen into abeyance a market has been found for the work of these women so they can labor in their own homes and earn a good return for their labor.

Free employment agencies, under government control, have been organized in most of the cities of any size, and through these many of the old abuses, especially those connected with household work, have been mitigated. These employment agencies are instrumental also in helping men to find work at their trades, but they are most important to the women of the servant class, both native and foreign-born. The Bureau of Household Research in various cities have taken up the domestic service problem in many phases for careful study. In Boston and in other cities, training schools for house-workers have been established.

Along the industrial and commercial line, philanthropic and public-spirited women are striving to improve the working conditions of women. The Consumers' League, which has branches all over the country, has by influence and persuasive force made its rules of fair treatment for women a household word among people of the better class. Those who understand the principles for which this league is working—perfect sanitary conditions, fair wages, fair hours, justice and mercy—will buy only of houses which conform to these rules.

New York City, where the largest number of women are employed, is a fair test of the propor-

tion of women in various branches of industry. They are as follows:

In machine garment-making	46,000
In hand garment-making	15,000
In tobacco work	8,000
In printing trades	8,000
In confectionery and bakeries	4,000
In textile work	1,000
In artificial flowers, etc.	1,000
In boots and shoes	1,700
In furs and fur work	1,300
In cord and twine	1,300
In leather goods	1,000
Clerks, stenographers, etc.	25,000
In laundries	30,000

This is exclusive of the professions and household work, in which, of course, New York takes the lead also.

Factory conditions in America are, as a whole, good. They are said by experts to be ahead of the laws,—this because the cost of labor is so great here that economy is best served by giving the workers as good physical surroundings as possible. This applies to factories where women are employed as well as to those where there are only men.

The approximate number of working women in the leading States is computed as follows:

New York	679,845
Pennsylvania	451,337
Massachusetts	390,000
Illinois	294,600
Ohio	246,000
New Jersey	154,500
Missouri	154,515
Michigan	131,600
Minnesota	96,800
Wisconsin	116,000
Indiana	176,700
Maryland	88,000
Connecticut	88,000
California	87,000
Kansas	55,500
Rhode Island	52,000
Georgia	27,581

In England during the last half century the use of machinery has enormously increased, and apparently the number of employees has been proportionately reduced. The number of persons employed has really increased, but not in proportion to the increase in manufacturing, because of the added machinery which requires less hand-work. The machinery becomes, with each new improvement, more and more automatic, and male labor has been largely and rapidly displaced by female labor in some trades, especially the textile trades. In no other trade in England are women to any extent organized, but in the textile mills about 110,000 women are enrolled in the unions, while only 12,000 are enrolled of all other trades combined.

As to organization among women, the movement may be said to be well started, but as yet no great results have been accomplished. Of the 5,000,000 women workers, only about 100,000 are organized in America. The best results of the work of organizers is seen in Chicago. There, according to recent reports, 30,000 women are organized in labor unions alone and 30,000 more in unions with men. But this 60,000 represents only a small proportion of the 300,000 women engaged in gainful occupations in the State of Illinois, a large proportion of whom are located in Chicago. The unions are strong, and those which consist only of women are doing active work. There are many good organizers and speakers among the women, and the rank and file of the unions are loyal and earnest. In one

WOMEN, LEGAL AND POLITICAL STATUS

branch of garment-making, where much of the work has heretofore been done by women in their homes, often under most unsanitary conditions, the organizers have succeeded in convincing the women that the work could be done better and with better financial returns in shops and under recognized union conditions. These union women now refuse to work with young girls under sixteen years of age and refuse also to allow children of school age to be employed in any way during school hours.

The Woman's National Trade Union League, officered partly by women of the leisure class and partly by the actual workers, has branches in several of the large cities and is carrying on a vigorous campaign of organizing work and education. The League is sending out speakers to address women's club meetings, in order to persuade women of the leisure class to help their sisters of the working world to better their conditions.

ANNA P. PARREY,
of 'Harper's Bazar', New York.

Women, Legal and Political Status of. Of all the anomalies which the progress of civilization presents, none is more wonderful than the history of women. Long held as an article of barter and trade, considered even in our own time rather as something to be possessed than as capable of possessing, the sex has yet, in the persons of individuals, been beloved, honored, idealized, crowned, and worshipped. The Christian dispensation has made woman a partaker in the great things of human destiny. Modern democracy has found it impossible to exclude her from its benefits and dignities. Finally, in a country in which education has come to be recognized as the only safeguard of public institutions, the privileges of instruction have been fully secured to her, and the immunities of ignorance have ceased to be considered as her peculiar perquisite. This progress, slow in its inception, long continued to be almost imperceptible. We may even say that at the beginning of the 19th century the legal position of woman was one of passive endurance. In privileged circles and among good people this was not often nor generally realized; but where manners were rude and where the limitations of poverty were felt, wives, and daughters became painfully aware of their pitiful condition before the law. Mothers did not own their children, nor the very garments which they wore. Any money that a married woman could earn or inherit became the property of her husband, and could be taken to pay his debts. In most departments of labor, moreover, a discrimination was made against women workers, and in the few employments in which they competed with men they received for the same service a much smaller compensation. At the time referred to, and for years afterward, a married woman could neither make a will nor enter into a contract without her husband's consent. In the administration of the great interests of the community she had no part and no voice.

Mary Wollstonecraft, in the late 18th century, and Frances Wright, in the early 19th, began to agitate the theme of woman's rights. The expression became at once a synonym for all that is considered unlovely and unfeminine. The advocates of the new theory, few in num-

ber as they were, were forced into a position of social isolation, in which they were commonly supposed to seek the eccentricity which was the inevitable result of the treatment received by them at the hands of the community. After the great liberation brought in view by the teachings of Christianity, the woman-world owes its first emancipation to the Society of Friends, in which were proclaimed the spiritual equality of men and women, and the right of the latter to be recognized as teachers of religious truth. Accordingly, we find Lucretia Mott present at the memorable convention in Seneca Falls, N. Y., in 1848, the first convention held in this country for the consideration of the civil and political rights of women. In this meeting Elizabeth Cady Stanton took a prominent part. With her appeared Frederick Douglass, gifted with so just a notion of the nature of freedom as to regard it as a right of white women as well as of colored men.

The anti-slavery agitation, indeed, carried the woman question along with it in its progress. When its culmination was reached, the champions of the slave became, with few exceptions, the advocates of a freedom which should know no limits either of color or of sex. The exigencies of the Civil War brought numbers of educated women into close and sympathetic relations with each other. They found themselves constrained to act in concert for the relief of the soldiers, for field and hospital service, and for the providing of necessary comforts for the sick and wounded. From this wider outlook the women never went back. The awful experience, too, of the war suggested to them many questions not to be answered by the old methods of reasoning. Lucy Stone, a farmer's daughter, had by long and patient labor enabled herself to acquire a college education. Gifted with a pleasing presence, a beautiful voice, and great force of conviction, she turned easily from the labors against slavery and intemperance, in which she won her early laurels, to the new advocacy which was destined to metamorphose the position of woman throughout the civilized world. In her husband she found a congenial and faithful helpmate. The pair, at first resident in New Jersey, transferred their household belongings to the neighborhood of Boston, from which point they unweariedly visited every part of New England, and much of the far West, pleading everywhere, with eloquent tongues, for the civil and political enfranchisement of women. Then arose pleadings which voiced the complaint of many hearts. Reason, the supreme authority, became convinced. Women said: "It is not right that men should be the sole arbiters of our fortunes. We, as well as they, are guardians of the community. We, with them, must have a voice in its affairs."

A very important part of the advance now noticeable in the legal position of women in Massachusetts is due to the legislative hearings which have been granted to the petitioners for woman suffrage during a long period of years. These hearings naturally were occupied by the prime matters of debate. At the same time, the exposure made of the legal and economic injustice suffered by women did much to stimulate legislative action in their behalf. In the legal profession itself we had some important allies. One of the most efficient of these was the late Samuel E. Sewall, a man greatly be-

WOMEN, LEGAL AND POLITICAL STATUS

loved and honored in his day. This good friend devoted much time to the devising of bills for the amelioration of the legal condition of our sex. Among these I recall the following: A bill enabling a married woman to make a business contract with her husband; one allowing her to make such a will as she should see fit; one giving her a right to her own clothes; one securing to her the right to be buried in the burial-lot of her deceased husband; a bill for the abolition of the widow's quarantine, that is, of the law which forbids her to remain more than 40 days in the house of her deceased husband without payment of rent, the right of the husband in corresponding circumstances being without legal limit. An important measure was brought before the legislature of Massachusetts by the Home Club of East Boston, seconded by the New England Women's Club of Boston. This was a bill ordering that men who walk the streets of cities at night with evidently vicious purposes should be liable to arrest and penalty equally with women of like character and purpose. A very general interest was felt some years ago in Massachusetts regarding what is called the age of consent for young girls. This was first fixed in that State at 10 years, it has been gradually extended to 16 years, which limit was reached in 1893.

Connecticut has the credit of having been the first State which gave to married women the power to make a will. This power the State conferred by act of legislature in 1809. Ohio followed 26 years later, in 1835. In 1836, an endeavor was made by Ernestine L. Rose and Paulina Wright Davis to circulate in New York petitions for property rights for married women. They met with but little success, women and men alike deriding them. Mrs. Rose, however, addressed the legislature of Michigan, asking for the political enfranchisement of women. This is said to have been the first address given by a woman before a legislature. In the same year, Abraham Lincoln made a public declaration of his belief in the propriety of giving the franchise to women, an act which did not interfere with his election, some 24 years later, to the office of chief magistrate of the United States. In 1837, a National Female Anti-Slavery Association held a convention in the city of New York. This appears to have been an entirely new departure for the sex. Angelina Grimké, a Southern lady, who had freed her own slaves, was mobbed in Independence Hall, Philadelphia, for speaking in public against slavery. The Grimké sisters became well known as advocates both of negro emancipation and of the political rights of their own sex. Their labors and those of Abby Kelley Foster and others in behalf of women soon began to bear fruit. In the years that followed, the public conscience became more and more exercised regarding the rights that women should enjoy in a free country. Legislative hearings in their behalf multiplied, and State after State relaxed the rigor of its exclusions. In 1840, Texas gave married women the right to make a will. Alabama did likewise in 1843, Vermont in 1847. In 1848, the State of New York secured to its women the control of property. Pennsylvania added to this the power to make a will. In this year was formed the first local suffrage association, at South Bristol, N. Y.

In 1849, Virginia conceded to wives the right to make a will. Massachusetts gave both powers in 1855, Rhode Island in 1856, Maine in 1857, Wisconsin in 1859, Maryland in 1860. There remain only seven of our States in which women do not enjoy some control of their property.

It would seem that the leaven of a new faith had been working in the community from the early years of the 19th century. This leaven, as was natural, was generated in the minds of men and women eminent in the domain of literature and recognized as leaders in thought. Margaret Fuller, who was born at about this time, devoted the fulness of her remarkable powers to the advocacy of human rights, and pleaded earnestly for the enlargement of education and opportunity for her own sex. In 1852, Mrs. Stowe placed herself in the forefront of the battle against slavery, and revealed to the reading public a power not previously recognized in her sex,—that of setting whole communities aflame with indignation against one form of tyranny. In 1854, Florence Nightingale's energetic services in the Crimean war shed a new lustre upon the annals of her sex. In 1867, John Stuart Mill, eminent as a philosopher and political economist, pronounced in the English Parliament a memorable speech in favor of full suffrage for women.

To return briefly to the record of the States,—the vigorous young Territory of Wyoming, at the first session of its legislature, in 1869, granted full suffrage to women. When, 23 years later, the Territory was admitted to Statehood, its delegates insisted on maintaining in its constitution the right of women to suffrage, and, refusing to enter the Union upon any other terms, carried their point. Municipal suffrage was granted to the women of Kansas by act of legislature in 1887. Finally, but not, we hope, to conclude, Colorado in 1893, and Utah and Idaho in 1896, bestowed upon the women within their bounds suffrage full and equal to that exercised by men.

The new power of eloquence was soon displayed by women when they became persuaded that they had a cause to plead. The walls of public buildings all the country over rang with their appeals for a better administration of justice, a fairer distribution of the functions of society. Mrs. Stanton, the Rev. Antoinette Brown, Susan B. Anthony, Mrs. Mary A. Livermore, and other courageous women spoke in public for reform. Anna Dickinson electrified audiences with her stirring words. Frances Willard won great multitudes to the cause of temperance. Conventions and congresses of women were held, in which the burning questions of the day were discussed from the woman's point of view. Kansas, Wyoming, Iowa, Colorado, heard the new gospel of women's hope—heard and heeded.

The power of associated action among American women has been greatly promoted by an agency scarcely dreamed of 50 years ago,—that of the women's clubs. The time for these had come in the world's economy, and almost simultaneously in two of our leading cities appeared the New England Woman's Club of Boston and the New York Sorosis. Until that time the word "club" was commonly understood to indicate a place, more or less convenient and elegant, where the men could meet together for purposes of business, amusement, or friendly

WOMEN, NATIONAL COUNCIL OF—WOMEN'S CLUBS

intercourse. The first women's clubs were started with the view of affording their members a more sympathetic and profitable communion than that conceded by fashion. The work of these clubs was to be the study of important social questions and the earnest endeavor to promote their true solution. Their recreations were to be furnished from the resources of art and literature. One of them, the Association for the Advancement of Women, originally founded by the New York Sorosis, devoted its energies to the holding of an annual congress of women in various parts of the Union. Wherever those meetings were held numbers of women, usually held apart by personal affairs, came together to welcome the pilgrims who had journeyed from afar. The congress lasted three days, and its sessions were devoted to the discussion of the most important and timely topics. The welcome given to its members, sometimes rather dull and tardy, always warmed into grateful praise. Helpful groups of workers everywhere sprang up in its tracks. When, more than a score of years after its beginning, Sorosis issued a call for a convention of women's clubs, a multitude appeared at her bidding, and a federation of women's clubs was formed which now binds together in amity the women of our whole domain, from Maine to Louisiana, from Massachusetts to California. The results of this wide extension of intercourse between different regions of our country can hardly be overestimated. Under its influence, sectional differences lose their unfriendliness of aspect, and sympathetic accord in the pursuit of worthy objects oversweeps and harmonizes all petty and personal discords.

In the first half of the century there were some seven occupations open to women. The last report of the Commission of Labor enumerates 300 honest ways in which they may gain a livelihood. In the earlier period free speech was denied to women by the great power of public opinion. To-day, the honors and opportunities of the platform belong as fully to women as to their brothers. They are not only permitted, but urgently requested, to use their gift of eloquence in behalf of the most important questions which come before the mind of the community. The very thought of conceding to women a vote on any matter of public interest was derided as ridiculous and intolerable. They have now the right of school suffrage in 22 of our States. In four States full suffrage is secured to them; in one, municipal suffrage.

Although Massachusetts does not lead in the march of woman's political advancement, she has been a strong centre of influence in the progress of the sex. She was first to concede to women the right not only of voting in the election of the school boards, but also that of membership in that important body. The question of school suffrage was first brought forward in Boston by Abby W. May, and the New England Woman's Club, of which she was a beloved officer, was the arena in which were heard the first arguments on the subject. In this same club, one of the earliest formed in the country, many matters of public interest were presented to the consideration of a wide circle of intelligent women. Dress reform, public sanitation, improved dwellings for working people, the beneficent providing of country and seaside outings for the children of the poor—these

and other kindred topics were ably presented to the club, many of whose members became actively engaged in promoting the measures just spoken of. The present state of things leaves us much to hope and work for, but the end, albeit not attained, is yet well in sight.

JULIA WARD HOWE.

Women, National Council of, an annual council of women held in the United States, at which meetings all national societies organized for any purpose whatsoever come to hear what other national societies are doing on other lines. They counsel together as to any reform, or movement, in which all might co-operate. The council has a cabinet, and is fashioned on a plan similar to the Senate of the United States. It is self-supporting, with the aid of patrons. Twenty national societies are represented in the council; they aggregate a membership of 1,200,000 women, the largest representative organization in the world.

Women's Clubs, associations of women organized for purpose of study, recreation, or for the promotion of certain philanthropic or political ends. Organization among women in the United States has grown to enormous proportions. It is impossible to compute with any degree of accuracy the membership of women's clubs, outside the federated bodies. This result has all been accomplished in 55 years.

Suffrage Organizations.—In 1848 Elizabeth Cady Stanton and Lucretia Mott issued the first call for a national suffrage association. These two women presided and organized the association. It had been a disputed question whether any woman could, or would, be able to fill this important position, the decision ultimately being given in the affirmative, by the famous negro orator,—Frederick Douglass. Susan B. Anthony immediately joined the other two women, and from their united efforts, "Individual Clubs" were formed, until in 1903, the "Suffrage" and "Political Equality" clubs numbered 1,000, with an approximated membership of 25,000. Their aim as expressed in their platform being to "promote the educational, intellectual, legal and political equality of woman, especially the right of suffrage."

From authentic records it has lately been proven that in 1859 Miss Constance Faunt Lee Roy founded the Minerva, a Woman's Literary Club at New Harmony, Ind. But to Sorosis (q.v.) belongs the honor of being the first permanent women's club organized, and remaining in existence uninterruptedly to the present time.

Sorosis.—In 1867 the Press Club of New York gave a dinner to Charles Dickens. A number of women who were either actively engaged in literary work, or connected with it in some manner, asked if they could be present at the dinner. It was ruled that they could not, although eventually a compromise was arranged and a few women attended the dinner—in some irregular way, probably as spectators in the gallery. Saint Valentine's Eve 1868 found many of these same women present at the residence of Mrs. Charlotte Wilbour. All expressed their indignation regarding the Dickens Dinner incident, when some brave soul hazarded the question—"Why can not we have a club of our own?" This chance remark was greeted with hearty enthusiasm and instant acceptance, and led to an organization formed by

WOMEN'S CLUBS

32 venturesome women, which terminated in the "Mother Club," Sorosis. The priority of this club is disputed by the "Boston Woman's Club," formed about the same time, but the Boston organization admitted men either as honorary or complimentary members. There had been societies both philanthropic and charitable, usually auxiliary to some male society. Nor were the "Suffragists" all women in their formation. Sorosis was the first woman's club founded exclusively by and for women. The chairman or temporary president was Alice Cary, who presided at one meeting only. Succeeding her as temporary president was Jennie June Croly. It was in 1870 that the first duly balloted for and elected president was placed in office, Mrs. Charlotte Wilbour, who served for five consecutive years, and in 1903 was again elected president, after an interval of 28 years. Sorosis sent in 1873 "a little messenger" to prominent women throughout the whole world, calling together a "congress of women." This act received the commendation of thousands of women, including nearly all the reigning queens. This congress was held in New York at the Union Square Theatre, and formed an "Association for the Advancement of Women," which held congresses annually in various parts of the country, until it was superseded by the General Federation of Women's Clubs.

General Federation of Women's Clubs.—This organization was formed at a meeting called by Sorosis in New York, March 1889. On the same date Sorosis reached its majority, and celebrated its 21st birthday. The Federation was designed to bring in closer touch clubs from all over the country. Its by-laws read:

The General Federation shall consist of Women's Clubs, State Federations, Territorial Federations, National Societies, and kindred organizations, the two latter to be admitted on the basis of individual clubs. Its meetings shall take place every two years, beginning in 1892. The place and date of meeting shall be decided by the Board of Directors. The annual dues for clubs shall be at the rate of 10 cents per capita. The annual dues for State Federations shall be at the rate of 25 cents per club. The annual dues for each local Federation of Clubs shall be at the rate of \$1 per club. Dues shall be paid annually the first of May, beginning with 1900.

Soon after the formation of the General Federation, the different States began to agitate the question of State federations. The first one to organize being Maine, 4 Sept. 1892. The other States rapidly fell into line, until now the General Federation consists of 39 State federations. These State federations are in turn composed of 3,516 clubs with a total membership of 291,000. Beside this there is an independent list made up of 800 individual clubs with membership of 60,750, giving the General Federation a total representation of 251,750 women. Many of the clubs have also formal county and city federations, and there are councils of various sorts too numerous to specify. Federating has in fact become the order of the day.

State Organizations.—The clubs of Arizona are devoted to literature, household economics, philanthropy, art, music, forestry and manual training. In Arkansas the clubs belong to the departmental study class, the largest organizations being the *Æsthetic Club* and the *Co-operative Club* of Little Rock, and the *Pacaba* of Helena. The subjects occupying the clubs of California are California history and landmarks, libraries and "portfolios," civics, house-

hold economics, education, forestry, and the usual departmental work. The largest clubs are the California Club of San Francisco and the Oakland Club. In Connecticut the largest clubs are the Woman's Club of Ansonia (278 members) and the Woman's Club of Waterbury (250). In Florida eight of the clubs represent the village improvement idea. They have accomplished a large amount of work in building shell roads, planting shade trees and beautifying the cemeteries. The Palmetto Club of Daytona maintains a kindergarten and day nursery for negro children. The largest club is "The Woman's Club" of Jacksonville with 120 members. In Georgia the federation committees represent the following departments: Education, music, social service and reform, industries, arts and crafts, village improvement, law-library. The Federation owns one traveling library. The village improvement and garden committee has accomplished a great deal in beautifying the streets, parks, school buildings, cemeteries and driveways of the State. Illinois is next to New York in the total number of women represented in federated State Clubs. The largest membership is found in the Chicago Teachers' Club with 3,378 members, and Chicago Woman's Club, 916. A school of Domestic Arts and Science has been established in Chicago, as also cooking classes in the public schools and dress-making in the vacation schools. Art has been promoted throughout the State by means of eight traveling picture galleries of photographs. There are 225 traveling libraries which are loaned to clubs for a period of six months. Philanthropy has been active in the establishment of a colony for the 10,000 epileptics of the State. Indiana's largest clubs are the Progress Club of South Bend, the Woman's of Indianapolis, the Century and Over the Teacups of Greencastle. The Woman's Club of Greencastle is the oldest in the State, having been organized in 1874, but it does not belong to the State Federation. All the clubs belong to the department study class. In Iowa the Dubuque Woman's Club is the oldest club, having been formed in 1876. The most prominent is the Des Moines Woman's Club, with its membership of 335. The Iowa State federation claims the honor of being the first to join the General Federation. Clubs of Iowa belong to the departmental study class, their special lines of work being village improvement, art in public schools, domestic science, child study, and development of the library system. The Kansas State Social Science Federation was organized in 1895. The largest clubs are the Hutchinson Woman's Club with 150 members and the Leavenworth Art League, 108 maintaining an art school. The clubs are all working in the department study line and are divided up into many small district federations. The Ladies' Library Association of Independence supports a public library of 3,000 volumes. The Woman's Club of Central Kentucky, in Lexington, the Woman's Club of Louisville and the Louisville Alumnae Club are of equal prominence in Kentucky. The Woman's Emergency Club of Louisville has the largest membership, 3,000. The 46 clubs of the State are devoted to a variety of objects,—art, literature, economics, current events, history, education, civics, music, child study and philanthropy. Social settlement in the Kentucky Mountains is a most important club work. The Maine State Federation

WOMEN'S CLUBS

was organized September 1892, being the first State Federation formed. The largest club is the Literary Union of Portland 632 members, which has introduced manual training and cooking in the public schools. The federation has secured legislation favorable to forestry; also an appropriation for a chair of forestry in the University of Maine, and has established many libraries. All Maine clubs belong to the study class, with two exceptions, the Mount Holyoke Alumnae Association, and the Education Industrial Union of Saco. In Maryland the largest clubs are the Arundel and the Council of Jewish Women, both of Baltimore, and having 400 members each. Federation clubs have established traveling libraries and free kindergartens. There are four clubs formed of alumnae, one for mothers, others that represent village improvement, art, philanthropic and literary interests; a Teachers' Educational Union and a Press Association. Michigan has county and city federations. Her largest clubs are the Twentieth Century of Detroit, Ladies' Literary of Grand Rapids, Woman's League of Battle Creek, and Ladies' Library Association of Kalamazoo. In Minnesota the largest clubs are the Twentieth Century Club of Duluth, Improvement League, Ladies' Thursday Musical and Teachers' Club, all of Minneapolis; and the Saint Anthony's Park Association, Grade Teachers Association and Schubert Club, all of Saint Paul. The club known as the Territorial Pioneers, of the same city, has secured a State park or forest reserve of 12,000 acres, and 200,000 acres pine land to be cut under forestry regulations; and has a yearly appropriation from the State for a State art society, also an appropriation of \$6,000 yearly for a State traveling library. Of the Minnesota clubs, 188 can be classed as study clubs. In addition to those mentioned there are three clubs devoted to civics, the Women's Auxiliary to the State Horticultural Society and the Winnebago Woman's Club. The most prominent clubs of Missouri are: Wednesday Club, Sisseton; The Athenaeum, Kansas City; Woman's Club, Marshall; Tuesday Club, Saint Louis; Woman's Club, Boonville; Domestic Science Club, Chillicothe, Tuesday Club, Columbia; Women's Club, Hannibal; Emerson Club, Joplin, Runcie Club, Saint Joseph; Shakespeare Club, Lebanon; Sorosis, Sedalia; Ladies' Saturday Club, Springfield; Monday Club, Webster Groves. The clubs all belong to the departmental study class. Their special work is represented by a large number of traveling libraries, vacation schools and playgrounds, with one art exhibition gallery. In Nebraska the largest clubs are the Woman's Club of Omaha with 426 members, and the Woman's Club of Lincoln, 695. The clubs of Nebraska have built up many free libraries, both stationary and traveling, and have also successfully run the Pingree Seed Garden for supplying free seed to the poor. The clubs of this State belong to the miscellaneous study class. In New Hampshire the largest club membership is found in the Woman's of Concord with 275 members; Nashaway of Nashua, 200; and New Hampshire Audubon Society of Manchester, 200. The departmental study class includes nearly all clubs in the State. The New Jersey State Federation was organized in 1894. There are 96 clubs with a total membership of 10,000. Although the State of New York is exceeded by two other States in the

number of clubs, yet it leads in the total number of women represented, 30,000. The largest clubs are the Alumnae of the Normal College, New York, with 1,750 members, and Kings County Political Equality League of Brooklyn, 1,100. New York's clubs are greatly diversified in character. Alumnae and college associations number 22; clubs devoted to civics, including the Health Protective, 11; child study and mothers' clubs, 6; professional clubs, 7; suffrage and political equality clubs, 6; patriotic, 4; educational and industrial, 9; library, 2; hospital associations, 3; ethical culture, single tax, parliamentary, civil service, diet, kitchen, reform, prevention of cruelty to animals, one club each. There are three Republican clubs. The remainder are the usual departmental and study clubs. Special federative work has been directed toward establishing a State industrial school for girls. The North Dakota State Federation embraces 41 study clubs; total membership 800. The Pioneer Club of Grand Forks is the oldest in the State. The strongest clubs, numerically speaking, in the State of Ohio are Cincinnati Woman's Club, 384 members, Woman's Century, Dayton, 325; Woman's Educational, Toledo, 252; Cleveland Sorosis, 207. Excepting the Cincinnati Educational League, Dayton Kindergarten, and the Faculty Club of the Ohio Wesleyan University, the clubs of the State belong to the departmental study class. They have aided in establishing libraries of which there are nearly 1,000 Traveling Libraries alone, in procuring lectures and pictures for the public schools. Through co-operation they have accomplished the establishment of two State normal schools, as well as many cooking and vacation schools, and playgrounds. The clubs of Oregon are devoted to the interests of education, library, domestic service, legislation, civics. The largest club is the Council of Jewish Women; the oldest, the Thursday Afternoon Club, of Pendleton. In Pennsylvania the largest clubs are the Alumnae Association of Girls' High and Normal Schools, membership 16,000; New Century, 600; Civic Club, 600; all of Philadelphia. The clubs of the federation devoted to literature, libraries, civics, art, domestic science, music, woman's suffrage, education, press, religion and philanthropy, sanitation, free kindergarten, village improvement and study. The Rhode Island State Federation was organized in 1896. It has 17 clubs with a total membership of 1,487. In South Carolina the largest club is the Greenville Alumnae with 443 members. Forty clubs are devoted to such subjects as literature, art, music, history, libraries; four clubs represent kindergarten interests. There is a Civic Club at Charleston. There is one club for child study and one for charity. Among others are the Park Association, Hospital Association, Intercollegiate Club and Alumnae Club. The South Dakota State Federation, organized January 1900, has 30 clubs. The Round Table Club of Deadwood organized the circulating library, that has since become the Deadwood Public Library. Tennessee has 37 clubs, the largest being The Nineteenth Century Club of Memphis with 200 members, and the Oasoli Circle of Knoxville, which has the distinction of being the oldest club south of the Ohio River. The State Federation owns or controls 55 libraries. Texas has 77 clubs, two are devoted to civics and three to kindergartens. There are 70

WOMEN'S CLUBS

Study Clubs, a Public School Art League and a Schubert Choral. The largest clubs are the Woman's Club of San Antonio, and the Woman's Temple. Over \$2,000 has been raised as a loan fund to aid talented young women, whom poverty would otherwise debar, in taking a course at the State University. In Vermont there are 27 clubs. The largest is the Woman's Club of Saint Johnsbury with 216 members.

National Organizations.—The National Clubs are the Daughters of the American Revolution, Daughters of the Revolution, Society of the Colonial Daughters of the 17th Century, and United States Daughters of 1812, organized "To perpetuate among their descendants the memory of those brave and hardy men who assisted in establishing the Colonies of America, and imperilled their lives and interests in the various colonial wars from May 1607, to December, 1699"; "To perpetuate the memory of the spirit of the men and women who achieved American Independence, to commemorate the heroes of the War of 1812, and to foster true patriotism and to aid in securing for mankind all the blessings of liberty." The activities of National Societies include the acquisition and protection of historical spots and the erection of monuments; the encouragement of historical research, the preservation of documents and relics, etc. They also encourage the celebration of patriotic anniversaries, and innumerable fine monuments, bronze tablets, and other memorials, are constantly voicing the patient labor of those tireless descendants of our former heroes and martyrs.

Individual Clubs.—Women's clubs are greatly diversified in their aims. The larger number belong to the social and literary study class, having departments devoted to history, travel, literature, art, music, civics, household economics, current events and kindred subjects. Besides these there are many clubs of the "health protective" class which co-operate with the boards of health of different cities. To this class are allied the village improvement clubs, which are devoted to municipal improvement. There are the purely civic clubs as well, and those of household economics, orders that strive to awaken interest in scientific knowledge of foods, fuel, clothing and sanitation. Societies for the study of child nature, societies of industrial art, art clubs, music clubs, parliamentary clubs,—all belong to the study class. Alumni associations are formed from the graduates of colleges, institutes, academies and seminaries. "To unite graduates for their mutual benefit, to preserve the pleasant relations formed during college life, and advance the cause of education among women." Kindergarten clubs have furthered that good work. Library clubs have built up free libraries. In the South and West traveling libraries have been established, doing a tremendous work toward free education. Professional clubs include many associations of teachers, nurses, lawyers and women of other professions. Press clubs, for members of the literary profession are in all large cities, and are justly popular. The Professional Woman's League (q.v.) of New York, one of the strongest clubs of this class, was organized in December 1892 for the benefit of members of the dramatic, musical and literary professions. It is a distinctive society in that it loans money to its members when sickness or sudden calamity overtakes them. It earned great commendation by

producing the Woman's Exhibition in 1902. The membership is 500. The Kanatenah of Syracuse, N. Y., is a business club with social features. There are very many clubs of working women all devoted to improvement and the better education of members. To this class belong the educational and industrial unions. The Woman's Christian Temperance Union (q.v.) is a large active body, doing the work its name implies.

The International Sunshine Society, founded by Mrs. Cynthia Westover Alden, 1896, and incorporated 8 March 1900, has for its object: "To incite its members to the performance of kind and helpful deeds, and to thus bring the sunshine of happiness into the greatest possible number of hearts and homes." This is the largest individual club in the country, although it might be classed in the line of federations, as it has branches all over the United States, and a few in other parts of the world. The estimated membership is 250,000.

Negro Women's Clubs.—The National Association of Colored Women was organized in 1894. Its motto is "Lifting as we Climb." It numbers 165 clubs. The Northeastern Federation with 55 clubs, and the Southern Federation numbering 40 clubs, are active members of the national body, the balance being individual clubs. The association meets biennially.

State Federations.—In 1903 a circular letter was sent to the president of every State Federation. In several instances no replies have been received. Therefore failure of representation in this list of Federated clubs is due to the fault of the presidents of the omitted Federations:

State Federations	Date of organization	Number of clubs	Total number women represented
Arizona	1901	8	250
Arkansas	1897	74	3,150
California	1900	196	2,450
Colorado	1893	108	4,700
Connecticut	1897	31	3,094
Delaware	1898	72	1,100
District of Columbia	1894	12	7,000
Florida	1893	34	500
Georgia	1890	51	3,000
Illinois	1894	344	23,737
Indiana	1900	47	1,490
Iowa	1893	201	10,500
Kansas	1893	110	6,000
Kentucky	1894	46	4,719
Louisiana	1902	12	500
Maine	1892	104	4,223
Maryland	1900	29	2,700
Massachusetts	1894	185	23,000
Michigan	1893	140	15,000
Minnesota	1893	193	8,000
Missouri	1893	114	5,000
Nebraska	1894	108	4,000
New Hampshire	1893	62	4,091
New Jersey	1894	96	10,000
New York	1894	201	30,000
North Dakota	1897	41	800
Ohio	1894	301	11,000
Oklahoma and Indian Territories	1898	60	1,500
Oregon	1899	86	1,000
Pennsylvania	1893	122	12,000
Rhode Island	1893	17	1,487
South Carolina	1898	39	2,000
South Dakota	1900	30	650
Tennessee	1896	34	1,000
Texas	1897	77	4,200
Utah	1893	28	1,000
Vermont	1890	27	1,357
Washington	1896	65	1,400
Wisconsin	1896	150	3,500
Total		3,535	228,036

Mrs. Edwin Knowles,
Professional Woman's League, New York.

WOMEN'S CLUBS — WOOD

Women's Clubs, General Federation of, an organization incorporated in the United States in 1892, and composed of over 2,675 women's clubs, having a membership of 155,000 women in the United States and foreign countries. The purpose of the federation is declared in its articles of incorporation to be "to bring into communication with one another the various women's clubs throughout the world, that they may compare methods of work and become mutually helpful. Constitutions of clubs applying for membership should show that no sectarianism or political test is required, and, while the distinctively humanitarian movements may be recognized, their chief purpose is not philanthropic nor technical, but social, literary, artistic, or scientific culture." Meetings of the federation are held biennially. There are 37 State federations auxiliary to the General Federation, and 683 single clubs in 41 States. See **WOMEN'S CLUBS**.

Women's Home Missionary Society. See **METHODISM IN AMERICA**.

Women's Rights is the term applied to the claims, made on behalf of women, to a legal, political, educational, and social status equal to that of men. The modern movement in this direction dates from about 1848, having begun in the United States. Notwithstanding the ridicule which assailed its early advocates, the claims of women have been largely recognized in more recent legislation in Great Britain and British colonies, as well as in America. In 5 States of the Union, Colorado, Idaho, Utah, Wyoming and Washington, women have been admitted to the franchise, Washington having passed the amendment in 1910. The campaign for equal suffrage is being waged more quietly and successfully in this country than abroad, where much trouble has resulted, especially in Great Britain. See **WOMEN, LEGAL AND POLITICAL STATUS OF**.

Woo'chang, China. See **WU-CHANG**.

Wood, wüd, Alexander, Scottish physician: b. Cupar, Fife, 10 Dec. 1817; d. Edinburgh 26 Feb. 1884. He was graduated from Edinburgh University with the degree of M.D. in 1839, and shortly afterward became one of the medical officers at the Royal College Dispensary in Edinburgh. He was one of the most prominent members of the Royal College of Physicians and Surgeons there, being president of that organization in 1858-61, and representing it in the general medical college in 1858-74. His most important contribution to the practice of medicine was the introduction of the use of the hypodermic syringe for administering drugs; this he first brought into notice by the publication of a pamphlet in 1855, entitled 'New Method of Treating Neuralgia by the Direct Application of Opiates to the Painful Points.' In addition to the pamphlet mentioned he wrote 'What is Mesmerism' (1851); 'Smallpox in Scotland' (1860); 'Preliminary Education' (1868).

Wood, Anthony, English antiquary and biographer: b. Oxford 17 Dec. 1632; d. there 29 Nov. 1695. He was educated at Merton College, Oxford, and gave his life mainly to matters connected with the history of the university. His researches resulted in his 'History and Antiquities of the University of Oxford' (1674). It was written in English; but

as it was thought proper that it should appear in Latin for the information of foreigners, it was translated into that language under the inspection of Dr. Fell, and published at the Oxford Press, as 'Historia et Antiquitates Universitatis Oxoniensis.' Wood's 'Survey of the Antiquities of the City of Oxford' was edited by Clark in 1889-99. In 1691-2 appeared his 'Athenæ Oxonienses,' an account in English of the writers and bishops educated at Oxford from 1500 to 1690, but for his criticisms of the Earl of Clarendon in this work he was expelled from Oxford. The English edition of his first work appeared as 'History and Antiquities of the Colleges and Halls in the University of Oxford' (1786-90), and 'History and Antiquities of the University of Oxford' (1792-6). The Oxford Historical Society published an edition of his autobiography and diaries by Clark in 1891-1901.

Wood, De Volson, American engineer: b. Smyrna, N. Y., 1 June 1832; d. Hoboken, N. J., 27 June 1897. He was graduated from the Rensselaer Polytechnic Institute, Troy, N. Y., in 1857, was professor of civil engineering in the University of Michigan, 1857-72, professor of mathematics in the Stevens Institute of Technology at Hoboken, 1872-85, and from the last named date professor of engineering there. Among valuable inventions by him may be mentioned a steam pump, pneumatic rock drill, and an air compressor. He published: 'Resistance of Materials' (1871); 'Bridges and Roofs' (1873); 'Co-ordinate Geometry' (1879); 'Reaction Motors'; etc.

Wood, Edward Stickney, American chemist: b. Cambridge, Mass., 28 April 1846; d. Pocasset, Mass., 11 July 1905. He was graduated from Harvard in 1867 and obtained his medical degree in 1871. He was assistant professor of chemistry in the Medical School 1871-6, and full professor there from 1876. He has published a translation of Neubauer and Vogel's 'Analysis of Urine' (1879); and was an expert on all matters relating to poisons. After 1873 he has been chemist of the Massachusetts General Hospital.

Wood, Eliezer Derby, American soldier: b. New York 1783; d. Fort Erie, Ont., 13 Sept. 1814. He was graduated from West Point in 1806 and in the second war with England conducted the defense of Fort Meigs in 1813, and was brevetted major for gallantry. He participated in the battle of Niagara on Lundy's Lane, 26 July 1814, and was brevetted lieutenant-colonel. In the sortie of 13 September he fell at the head of his command. A monument to his memory was erected at West Point.

Wood, Ellen Price, English novelist, best known as Mrs. HENRY WOOD: b. Worcester 17 Jan. 1814, d. London 10 Feb. 1887. In 1834 she married Henry Wood, a member of a banking and shipping firm, and from then till 1836 lived in France. She began her literary career by contributing to 'Bentley's Miscellany' and the 'New Monthly Magazine,' and in the ingenuity of her plots excelled all her English contemporaries. Her books are not sensational in the ordinary acceptation of the term, and display beside remarkable constructive skill, not a little keen character drawing and descriptive power. They have been widely circulated both in this country and England and among them

WOOD

are: 'East Lynne' (1861), which has had an enormous success both as a book and a drama, and still continues as popular as ever; 'Mrs. Halliburton's Troubles' (1862); 'The Channings', which is a most entertaining study of schoolboy life (1862); 'The Shadow of Ashlydyat' (1863); 'A Life's Secret' (1867); 'Roland Yorke' (1869), a continuation of 'The Channings'; 'Dense Hollow' (1871); 'Within the Maze' (1872); 'Edina' (1876); 'Pomeroy Abbey' (1878); 'Court Netherleigh' (1881); 'The House of Halliwell' (1890); and the 'Johnnie Ludlow Stories' (1874-80). Consult 'Memorials' by her son (1894).

Wood, Sir Evelyn, English general: b. Cressing, Essex, 9 Feb. 1838. He was educated at Marlborough College and joined the navy in 1852. During the Crimean war he served in the Naval Brigade, and was severely wounded while carrying a scaling ladder to the redan. In 1855 he entered the army as cornet, in 1858 served in India as a brigade-major and gained the Victoria Cross for conspicuous valor, in 1860. In 1873 he served in the Ashantee war, and on his return from this campaign was called to the bar at the Middle Temple (1874). He served in the Zulu war of 1879 and was promoted to the rank of brigadier-general after his victory at Kambula. He was second in command of the British forces in the brief Transvaal war of 1881, and in 1882 went to Egypt as commander-in-chief or sirdar. In 1893 he became quartermaster-general to the forces, and held that position till his appointment in 1897 to the office of adjutant-general to the forces. He has published: 'The Crimea in 1854' (1894); 'Cavalry at Waterloo' (1896); 'Cavalry Achievements.' Consult 'Life' by Williams (1892).

Wood, Fernando, American politician: b. Philadelphia 14 June 1812; d. Washington, D. C., 14 Feb. 1881. In 1820 he removed to New York, where he was educated, and entered business as a shipping merchant. He early became identified with political organizations, and was active as campaign writer and orator. He was elected to Congress in 1840 on the Democratic ticket, serving one term. In 1850 he retired from business and in that year was the Tammany candidate for mayor of New York, but was defeated. As candidate of the same organization in 1854 he was elected mayor of New York, introduced various reforms and was re-elected in 1856 almost without opposition. Discussion in the organization led him and his followers to form a rival body called Mozart Hall. He was the unsuccessful candidate for mayor of this organization in 1858, but in 1860 was a third time elected mayor in opposition to both Republican and Tammany candidates. In 1861, when secession was under discussion, he recommended that New York should secede and become an independent city. He was elected to Congress in 1863 and 1867.

Wood, George, American author: b. Newburyport, Mass., 1799; d. Saratoga, N. Y., 24 Aug. 1870. He was clerk in the War Department (1819-22), and afterward chief of a division in the United States Treasury Department. He published: 'Peter Schlemihl in America' (1848); 'The Modern Pilgrim' (1855); 'Marrying Too Late' (1856); 'Future Life' (1858), republished as 'The Gate Wide Open.'

Wood, George Bacon, American physician: b. Greenwich, N. J., 13 March 1797; d. Philadelphia, Pa., 30 March 1870. He was graduated from the University of Pennsylvania in 1815 and from its medical department in 1818, and was professor of chemistry at the Philadelphia College of Pharmacy 1822-31, and of materia medica there 1831-5. He held the chair of materia medica at the University of Pennsylvania 1835-50, and of the theory and practice of medicine there 1850-60, endowing an auxiliary faculty of medicine in the university in 1865. He published 'Treatise on the Practice of Medicine' (1847); 'Therapeutics and Pharmacology' (1856); and with Franklin Bache prepared 'The Dispensatory of the United States' (1833, 17th ed. 1894).

Wood, Henry, American author: b. Barre, Vt., 16 Jan. 1834; d. 29 March 1909. He graduated from a commercial college in 1854 and published: 'Natural Law in the Business World' (1887); 'Edward Burton,' a novel (1890); 'God's Image in Man' (1892); 'Ideal Suggestions' (1893); 'The Political Economy of Humanism' (1901); 'The Symphony of Life' (1901); etc.

Wood, Mrs. Henry. See **WOOD, ELLEN PRICE.**

Wood, Horatio Curtis, American physician: b. Philadelphia, Pa., 13 Jan. 1841. He was graduated in medicine from the University of Pennsylvania in 1862, and was professor of medical botany there 1866-76, and clerical professor of diseases of the nervous system since the last named date. In addition to many professional papers he is the author of 'Thermic Fever' (1872); 'Physiological Therapeutics' (1874, 9th ed. 1894); 'A Study of Fever' (1875); 'Nervous Diseases and their Diagnosis' (1881); 'Syphilis of the Nervous System' (1889).

Wood, James Frederick, American Roman Catholic prelate: b. Philadelphia, Pa., 27 April 1813; d. there 20 June 1883. He was educated in England and on returning to the United States entered the banking business. In 1836 he went to Rome to study for the priesthood and after his ordination in 1844 became an assistant rector of the cathedral at Cincinnati, and afterward pastor of St. Patrick's Church. In 1857 he became bishop of Philadelphia, where he completed the magnificent cathedral in Logan Square. He also established at Overbrook the Seminary of St. Charles Borromeo. He was created archbishop in 1875. He was especially opposed to the introduction of political issues from other countries to the United States.

Wood, John George, English naturalist and Anglican clergyman: b. London 21 July 1827; d. Coventry, Warwickshire, 3 March 1889. He was graduated from Merton College, Oxford, in 1848, and took orders in the English Church. In 1856-62 he was chaplain to St. Bartholomew's Hospital, in 1858-63 a reader at Christ Church, Newgate Street, and for seven years from 1869 conducted the festivals of the Canterbury Diocesan Choral Union. During 1879-88 he delivered numerous lectures on natural history in Great Britain and America. His numerous works contributed very greatly to popularize natural history. Among them are: 'The Illustrated Natural History' (1851); 'Bees' (1853); 'Common Objects of the Sea-

WOOD

Shore' (1857); 'Common Objects of the Country' (1858); 'Routledge's Illustrated Natural History' (1859-63), his most important work; 'Common Objects of the Microscope' (1861); 'Our Garden Friends and Foes' (1863); 'Homes Without Hands' (1864-5); 'Common Shells of the Sea-Shore' (1865); 'Fresh and Salt Water Aquarium' (1868); 'Natural History of Man' (1868-70); 'Bible Animals' (1869-71); 'Insects at Home' (1871-2); 'Insects Abroad' (1874); 'Man and Beast: Here and Hereafter' (1874); 'Field Naturalist's Handbook' (1879-80); 'Half-Hours in Field and Forest' (1884); 'Half-Hours with a Naturalist' (1885); 'Romance of Animal Life' (1887). Consult 'Life' by his son (1890).

Wood, John Seymour, American lawyer: b. Attica, N. Y., 1 Oct. 1853. He was graduated at Yale in 1874 and at Columbia Law School. He was editor of the 'Bachelor of Arts Magazine' (1896-8), and has published: 'Gramercy Park: A Story of New York' (1892); 'A Daughter of Venice' (1892); 'College Days' (1895); 'A Coin of Vantage' (1896); 'Yale Yarns' (1897); 'An Old Bean, and Other Stories'; etc.

Wood, Leonard, American soldier and administrator: b. Winchester, N. H., 9 Oct. 1860. He was graduated at the Harvard Medical School in 1884, and in 1885 became a contract-surgeon in the United States army. In 1886, as first lieutenant and assistant surgeon, he served in the campaign against Geronimo. When the war with Spain began, in 1898, with Theodore Roosevelt, he organized the 'Rough Riders,' and was made colonel of the regiment, which he commanded at Las Guasimas. At the battle of San Juan Hill he led a brigade; was commissioned a brigadier-general of volunteers 8 July 1898; promoted major-general 8 December; and on 4 Feb. 1901 was made brigadier-general in the regular army. In July 1898, after the surrender of Santiago, he was placed in command of the city, and was military governor of Santiago until December 1899, when he succeeded Gen. Brooke as military governor of Cuba, and continued in that position until the withdrawal of the United States from the island in May 1902. In 1903 he was assigned to the command of a division of the army in the Philippines and made military commander and civil governor of the Sulu Archipelago. In the same year he was nominated for a major-generalship in the regular army. When he took charge in Santiago sanitary and social conditions throughout the province were bad beyond description, yellow fever and other infectious diseases being prevalent, food scarce, and demoralization general. By his vigorous administration he soon brought about marvellous improvement. Infectious material was destroyed, cleanliness secured, drainage and water supply provided, yellow fever quickly and, as is believed, permanently banished, the death-rate greatly lowered, order and efficient government established, and public schools introduced. When Gen. Wood ended his work in Cuba the schools numbered nearly 4,000, with as many teachers (mostly native), an enrolment of over 250,000, and a daily attendance of 140,000; and the reforms accomplished in Santiago had been extended to Havana and to other parts of the island. The laws were revised, the judiciary reorganized,

charities and corrections better administered, public works remodeled, police discipline secured, and fit election laws and methods adopted. The government of Gen. Wood was military only in name, and his sanitary, civil, and social reforms prepared the Cuban people for the orderly self-government which the island now enjoys.

After the nomination of Wood for major-general in the regular army a storm of protest was raised in the public press of the United States, mainly on the ground of his alleged want of military training and experience and that the promotion was made over the heads of veteran officers and through personal and political influence. Grave charges were also made against his conduct in Cuba, and when the question of his confirmation as major-general came before the Senate these were investigated by that body, and his nomination was finally confirmed. General Wood was in command of the division of the Philippines 1906-8 and since 1908 has commanded the department of the east, Consult: 'Cuba: Civil Report of Gen. Wood' (1901); his article, 'The Military Government of Cuba' in 'Annals of the American Academy of Political and Social Science,' Vol. XXI., No. 2 (1903); Baker, Gen. Leonard Wood, in 'McClure's Magazine,' Vol. XIV., pp. 368-79 (1900); and 'The Outlook,' 2 Jan. 1904, 'The Case of Gen. Wood.'

Wood, Thomas John, American soldier: b. Munfordville, Ky., 25 Sept. 1823; d. Dayton, Ohio, 25 Feb. 1906. He was graduated from West Point in 1845, served under Gen. Taylor in the Mexican War, and was on frontier duty in Texas 1849-55. At the outbreak of the Civil War he was promoted lieutenant-colonel in the Federal army, and later brigadier-general of volunteers. He commanded a division at Shiloh and Corinth and also at Chickamauga and Missionary Ridge, and for gallantry at the latter engagement was brevetted brigadier-general. He commanded the Fourth corps at Nashville and for his services there was brevetted major-general in 1865. In June 1868 he was retired from the service.

Wood, Thomas Waterman, American artist: b. Montpelier, Vt., 12 Nov. 1823; d. New York 1902. He studied art in Boston in 1848, afterward continuing his studies in Europe. In Düsseldorf he was the pupil of Hans Gude. He was well known as a portrait painter and for several years traveled about the country in this capacity, finally settling in New York in 1866. After removing to New York Mr. Wood devoted himself almost entirely to genre painting, in which he chose familiar subjects in American life. He became a member of the National Academy in 1871, and from 1878-87 was president of the American Water Color Society. He was president of the National Academy of Design from 1891 to 1899. He also was one of the founders of the New York Etching Club, and was a regular contributor to its exhibitions, most of his etching being after his own paintings. Three of Mr. Wood's paintings, 'The Contraband,' 'Recruit,' and 'Veteran,' exhibited at the Academy of Design in 1867, now are among the pictures at the Metropolitan Museum of Art. Many of his portraits are in the Chamber of Commerce col-

lection. During the last decade Mr. Wood visited Europe three times, copying the best masters in London, Paris, Saint Petersburg, and Cassel, giving especial attention to Rembrandt and Murillo. With these copies and with original works of his own he founded the Wood Art Museum in his native town.

Wood, Walter, English author: b. Bradford, Yorkshire, 10 March 1866. He was for 10 years attached to the staff of the *Yorkshire Daily Observer* and has published 'Barrack and Battlefield' (1897); 'Famous British Warships and Their Commanders' (1897); 'With the Flag at Sea' (1901); 'Wellington's Dispatches' (1902); etc.

Wood, Walter Abbot, American inventor: b. Mason, N. H., 23 Oct. 1815; d. Hoosick Falls, N. Y., 15 Jan. 1892. Having early given his attention to the improvement of farming implements, he in 1850 introduced the Mauny harvesting machine with original improvements. He continued to improve mowers and reapers and in 1884 disposed of 48,300 machines. His inventions were covered by about 30 patents, and he was awarded first prizes at the World's Fair in Paris in 1867, in Vienna in 1873, in Philadelphia in 1876, and in Paris in 1878.

Wood, William, English colonist in America: b. about 1580; d. Sandwich, Mass., 1639. He came to America in 1629, returned to England in 1633, but not long after again sailed for Massachusetts, where he settled first at Lynn, which he represented in the General Court in 1636, and afterward (1637) at Sandwich, of which he became town-clerk. In 1634 he published in London 'New England's Prospect,' the first printed account of Massachusetts. The perfect copies extant contain a map of the region. The prose narrative is interspersed with rimed descriptions of natural history. This curious work was reprinted in 1764 (Boston) and 1865 (also Boston; Prince Society).

Wood-Allen, Mary, American physician: b. Delta, Ohio, 19 Oct. 1841; d. 2 Jan. 1908. She was graduated at the Ohio Wesleyan University in 1861, and at the Medical Department of the University of Michigan in 1875. She practiced medicine for a time in Newark, N. J., and later removed to Ann Arbor, Mich. She published: 'Man Wonderful in House Beautiful' (1883); 'Teaching Truth' (1892); 'Child Confidence Rewarded' (1893); 'Marvels of Our Bodily Dwellings' (1896); 'Almost a Man' (1896); 'Almost a Woman' (1897); 'Baby's Firsts' (1898); 'What a Young Woman Ought to Know' (1898); 'What a Young Girl Ought to Know' (1897); 'Ideal Married Life' (1902); etc.

Wood. Wood is a more or less compact tissue which constitutes the part of the trunks, branches and roots of arborescent vegetable growth, lying between the bark and the soft sapwood next the bark, and the pith at the centre. The word "wood" is derived from the Anglo-Saxon *widu*, a tree. The outer layers, or sapwood, are called the alburnum. The inner solid wood is called the duramen. Timber is wood large enough for architectural uses, such as boards, planks, beams. The term hardwood is applied to such woods as mahogany and oak where the cells have thick walls and are closely packed together. Soft wood has large cells and

thin cell walls, such as white pine, cedar, poplar. It would seem in this century that wood is losing its importance as a material of construction. For framing, iron and steel seem to have dethroned wood; and even in furniture, iron has taken the place of wood in certain parts. Everything is iron or steel: a series of metal beams covered with plaster hidden from the eyes of the prying public as well as sheltered from fire; above this a good bed of plaster or poor, cementless, concrete; the builder "rests easy," the effect is good and satisfying, so we build iron floors. After a while, we invent new forms of framework. We cover the I-beams from which the floor arches spring, with terra cotta or plaster, leaving the large beams to show under the ceilings, wood seems to be banished. Iron is even supplanting the lath and plaster partitions, and expanded metal or wire-screen lath with channel or angle-iron stiffeners are used even in inexpensive construction. The wooden stagings and centerings with which the stone and iron structures are erected are almost as interesting as the structures themselves. Wood is elastic, comes back into place, and is easily worked. Wood is not imperishable, neither is iron. One reason

FIG. 1.

why wood is being used so little in construction is because it is not employed in a natural way: instead of leaving it natural, it is covered with plaster; often wood is used green when it should be seasoned. A practical way of getting at the quality of wood is to find its price in the market. For example, oak which would sell at \$110 per M. would be good enough for the best floor, while oak for furniture would be sold for half as much more.

The principal countries where wood has been generally used as building material are Switzerland, Norway and Japan. The chalets of Switzerland with their big overhanging roofs and flat balustrades with jig-sawed patterns, are well known. The wooden construction of Norway and Sweden has some resemblance to these. The Japanese wooden houses and temples are unique and show their artistic development. Vitruvius describes the woodwork of ancient Rome, but nearly all traces of it have disappeared. Caesar's bridge is well known to all students. The huge concrete and stone buildings of the Roman empire were built on wooden centering, which was as carefully constructed as if it were to be permanent itself. The half-timber work of the Middle Ages where the framing was made of heavy timbers was filled in between with plaster, making a very solid permanent construction. The ceilings of the churches of the Middle Ages were frequently worked out in timber and many of the Gothic churches had timber roofs, which followed out the feeling of the Gothic style. The shingle architecture of

the modern American country house, the old colonial buildings and the still earlier log cabins are good examples of what can be done with wood construction. The defects of timber are caused by splitting, knots, rot, sap-wood, warping. Timber should have a straight grain, should be well seasoned, and if not weather-seasoned, should be kiln-dried.

The development of the modern system of wood framing resembles strikingly the still more recent American methods of steel construction, as both are a veneer on a simple framework. Neither the country house nor the office building expresses its constructive features on the exterior. This, of course, has an economic cause: it is much easier to start the rough carpentry with the sill when the mason has completed his wall, and carry out all the rough framing and boarding with the knowledge that none will show as finished work; all the effort will tend to rapidity and strength. The exterior is then covered with shingles or clapboards, and the interior with lathing and plastering, leaving a finished plaster surface. Then follows the "joiner" or carpenter for the finished interior work, which is put in after the plastering is dry, and therefore is entirely separate in time and character from the rough framing.

Defects in Timber.—It is very important to



FIG. 2.

remove the sap-wood with care, for it constitutes a soft, spongy mass, containing fermentable sap, and allowing dampness to penetrate very easily; rot develops, and worms appear, and from the sap-wood, go through the whole substance. Lumber is piled or "stuck" after it is sawed with small sticks of wood between the pieces to allow a circulation of air, and allowed to remain for several months. For interior finish, the wood is generally seasoned, by artificial means, that is, "kiln-dried." The pieces are put in a room heated by steam to a temperature of about 150° F. and allowed to remain for several days or weeks until thoroughly dry.

Preservation of Timber.—Up to the present time, the greatest attention has been given to the preservation of railroad ties. The principal processes are those where either creosote or zinc chloride is used. Sometimes a combination is used. All French and English ties use the creosote process which gives them a life of 20 to 25 years. A recommended combination is 38 per cent dead oil of coal tar, 60 per cent resin melted, 2 per cent formaldehyde. Inject this after raising timber to 250° F.

Quarter-sawing.—This term is applied to a log cut lengthwise into quarters, so that the quarters can be cut into boards parallel to the radius 45 degrees between these cuts. These sections are so nearly in the plane of the medullary rays that they show the best grain, especially in oak, and boards cut in this way are less likely to warp and show little shrinkage. Often

the grain of wood which renders it weak, will give a good effect for paneling or veneering. In Fig. 1, plank A is quarter-sawed and will lie flat and will not splinter; plank B is poorly cut, being taken from one side of the log, as in Fig. 2 A. If the first board were taken directly through the centre of the log and the others parallel or perpendicular to it the grain would lie nearly parallel with the medullary rays as shown at B (Fig. 2). In Fig. 1, plank B is poorly laid, and would stand much better if laid with the heart or hollow side down as at Fig. 1, C.

Framing.—From the period of the first settlement of America, the cheapness of wood has made it the popular building material. The log-cabin was built of the logs cut when the early settlers cleared the land. Two sides were adzed off and the ends of the logs were notched so as to fit closely at the corners. The cracks were filled in with mud and the roof framed with small roughly worked rafters which were covered with split shingles. The advent of the saw-mill soon brought into use "dimension" lumber, rectangular in section, to be set so that its broadest side should take the strain. For example, 2-inch by 8-inch floorings 12 inches or 16 inches apart and strongly braced or "bridged" by small pieces nailed in between, took the place of 10-inch by 10-inch timbers which spanned the same space at greater intervals but necessitated the use of much more timber on account of their own size and also because of the larger amount of timber necessary for filling in between. This evolution has brought us to two methods of wood construction, the "full frame" and "balloon framing," the latter being used for small buildings, such as ordinary dwelling-houses, only.

Northern Pine (rare) (*Pinus sylvestris*) is also called Norway pine and Scotch fir, and is known in Great Britain as red or yellow deal. It is found in the northern parts of Europe, especially in Scandinavia on the mountains where there are large forests of these trees. Its color is warm with reddish tones. When first cut it is very resinous. It is one of the most useful pine woods and is strong, durable and easily worked. Its timber, which is used in both civil and naval architecture, is exported from Norway, Sweden, Prussia and Russia.

Canada Red Pine (*Pinus resinosa*).—This wood is sometimes called Norway pine. It takes the name of red pine from the color of its bark. The trees are found throughout Canada, but the best red pine is found in the northern parts of Wisconsin and Minnesota. The trees are sometimes 140 feet high. Its wood is tough, and has but few knots. It is used in construction of all kinds, flooring, piling, etc.

White Pine (*Pinus strobus*).—Also called Weymouth pine after Lord Weymouth, who planted it first in England in 1708. The trees are found in large forests in Canada and in the Great Lakes region. The wood is soft and easily worked, of a straight grain, of a light straw color and has but few knots. The tree is tall and effective, reaching sometimes 200 feet in height. It was formerly the most extensively used soft wood in America.

Yellow Pine (*Pinus mitis*) is also called short-leaved pine to distinguish it from the long-leaved Georgia pine. It is a native of the western and Southern States. West of the Mississippi its hard fine grain of wood is made into timber,

RADICAL SECTIONS OF TYPICAL WOODS

1. Yellow Willow. 2. Black Walnut. 3. White Cedar. 4. Sycamore. 5. White Oak. 6. Redwood. 7. Tulip Tree or Whitewood. 8. Black Ash. 9. White Spruce. 10. White Pine. 11. American Elm. 12. American Holly. 13. Wild Black Cherry. 14. White, or Canoe Birch. 15. Live Oak. 16. Silver Maple. 17. Shellbark Hickory. 18. American Beech. 19. Chestnut. 20. Yellow Locust.

WOOD ALCOHOL—WOOD-BORING BEETLES

but the timber is not so large as that of the Georgia pine.

Georgia Pine (*Pinus palustris*), known as the long-leaved or Georgia pine and as the turpentine tree. Its wood is coarse and owing to its having so much resin it is extremely difficult to work. The wood is used for coarse lumber, ship-building, heavy timber, and for obtaining tar, pitch, and turpentine.

Norway Spruce (*Picea excelsa*) is a tree which attains great height, often growing as high as 150 feet, and is a native of the northern parts of Europe and Asia. Its branches grow quite near to the ground as do all firs. This wood has many hard knots, which makes it very difficult to cut. It is used nevertheless for masts, spars, boards, etc. Large quantities are shipped from Russian ports and some of the best stock comes from Christiania.

American Spruce (*Picea nigra*), or black spruce, much resembles the Norway spruce except that its color is grayer and colder. It grows from 50 to 70 feet in height and is found in British America and northern parts of the United States. Its wood is light and strong and is much used in ship-building, and general rough framing.

Cedar, an evergreen tree of the coniferous genus. Its wood is soft and of a reddish brown color and sometimes has a very fragrant odor. It is used for chests and cigar boxes. There are three known species of cedar. The cedar of Lebanon is noted, of which there still remains a grove of some 400 trees.

Basswood (*Tilia americana*).—This wood is the American Linden or lime tree; it is also called bass. It is a yellow ochre in color and straight-grained. It does not wear very well but stains and polishes easily.

American Whitewood (*Liriodendron tulipifera*) is the whitish timber of the tulip tree, the wild cinnamon, basswood and Guiana plum trees. It grows in the Middle States. Its wood is of a pinkish gray color, very soft and of a smooth surface. It is used largely for sheathing. It is exported from New York and Philadelphia.

Birch American (*Betula lutea*), called also yellow birch. This wood has a smooth outer bark, close grain, moderately hard wood and is used for making furniture, for fuel and other purposes. The oil from its bark is used to give Russia leather its odor.

Ebony (*Diospyros ebenacea*) is the name given to a wood of a very dark color. It is very hard and heavy and often jet black and sinks if put into water. It takes a fine polish and is much used for high class cabinets, toilet sets, inlaying, making flutes, etc. It is a native of the flat parts of Ceylon. Its usual color is black, but the variety in Jamaica is green.

Beech (*Fagus*) is a large straight tree with beautiful thick foliage. Its height is from 50 to 70 feet. The bark has a smooth, hard surface and blue gray in color. Beech is not much used for building work, for it is not durable except when very wet or very dry. It warps but little and its hardness makes it well fitted for making a great variety of tools and for cabinet work.

Oregon Pine (*Pseudotsuga taxifolia*), known also as Oregon fir, Nootka fir and Douglas pine. Large forests of these trees grow in the western part of the United States and Alaska.

The following are different kinds of lumber which are used for different purposes:

Piles.—Oak, elm, beech, spruce. Posts set in the ground, hemlock, acacia.

Strong Construction.—Oak, teak, yellow or Georgia pine. Available in damp situations, oak, beech, elm, acacia, alder, chestnut. For large timbers, Oregon pine, Georgia pine, oak, bay mahogany, chestnut.

Floors.—Oak, maple, birch, beech, and rift Georgia pine are the best floors for hard wear; North Carolina pine for cheaper floors, and spruce floors where they are to be covered or painted. Oak, hard pine, teak will wear the longest.

Interior Finish and Panels.—Cypress, North Carolina pine, oak, mahogany, sycamore.

Window Sills.—Oak, white pine, mahogany.

Stair Treads.—Oak, hard pine, teak. For school interior finish, ash, hard pine, North Carolina pine.

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FRANK A. BOURNE,
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Wood Alcohol, Wood Naphtha, Wood Spirit, etc. See ALCOHOL.

Wood-boring Beetles, beetles which lay their eggs in or upon wood, into which the larvæ begin to bore immediately after hatching, and from which they derive their sole sustenance. Living upon this innutritious substance their growth is generally slow, and by the end of the several years spent in the larval condition they have often excavated extensive galleries which increase in diameter as the larvæ grow. The larvæ of many beetles feed upon dead or decaying wood only, and many of these may be considered useful to man, as they assist in reducing stumps and fallen limbs to a condition of vegetable mold. Others confine their attacks to the bark, and are seldom serious pests. Many species bore into sound wood either in the standing growing tree, in the dressed lumber, or even in the finished house or article of furniture. Such often commit incalculable damage. The families *Cerambycidae* and *Buprestidae* are notorious as comprising species almost exclusively of wood-boring habits, and those whose larvæ do not excavate wood burrow into roots or soft plant tissues. The *Cerambycidae* (q.v.), or longicorn beetles, include one of our largest beetles, the broad-necked priamus (*Prionus laticollis*), which

WOOD CARVING

reaches a length of nearly two inches and is unusually robust for the family; it is of a deep brown-black color, and the jaws are exceedingly stout. The great white larvæ are two or three inches long and bore into the roots of forest and orchard trees and blackberry plants. The latter are quickly killed and even large trees will succumb if the borers are abundant. They live three years. The apple-tree borer (*Saperda candida*) in the beetle state is brown with a conspicuous white stripe running the entire length of the body on each side above. It flies mostly at night during the early summer months and lays its eggs on the trunks of apple, quince and pear trees near the ground. The larva is cylindrical and very strongly annulated and when fully grown is an inch long. It lives three years, the first one being spent in the sap-wood, the others in the interior of the trunk. Its attacks are frequently fatal and the only effective measures are preventives. A strip of tin or wire gauze nailed to the tree trunk from the ground to a height of two feet will prevent most of the females from depositing their eggs. Another exceedingly serious pest is the locust-tree borer (*Cylindrus robinia*) which has habits similar to the last and which often riddles the trunks of locust-trees with its burrows, killing them in a few years. The beetles are very pretty, being dark velvety brown, with angulated cross-lines of yellow. They abound during the early autumn and feed upon the pollen of the goldenrods. Numerous closely related species attack other hardwood trees. A peculiar habit is possessed by the twig-girdler (*Oncideres cingulatus*) which in order to provide its larvæ with the dead wood upon which they feed cuts a deep circular trench around the twigs of hickory and other forest trees below the point at which its eggs have been deposited. The twig dies, falls to the ground, and the larva completes its span of life in security.

The species of *Buprestidae* (q.v.) differ greatly in appearance from the longicorns; but have similar habits. The larvæ are distinguishable by the greatly expanded prothoracic ring immediately following the head, which is very small and retractile. They are always footless. Although the buprestids nearly equal the longicorns in number of species, and exceed them in variety of forms those in our fauna are smaller and because of their plainer colors, much less conspicuous. Many of the tropical species, however, are of great size and brilliant colors, and some of their larvæ, which may exceed four inches in length, are eaten. A species very injurious to pear orchards is the sinuate borer (*Agrilus sinuatus*) whose extensive winding galleries in the cambium layer often almost completely sever the bark from the wood and kill the tree. The beetle is about half an inch long and both it and the larvæ are slender. Blackberry canes are often infested by another species (*Agrilus rubicollis*), the larvæ of which excavate irregular passages and cause the formation of gall-like enlargements. The species of *Chrysobothris* form excavations beneath the bark and in the sap-wood of various forest trees, and one species (*C. femorata*) is an orchard pest and another (*C. harrisii*) injures the white pine.

The true bark-borers mostly belong to a family, the *Scolytidae*, closely related to the weevils (q.v.). They form most elaborate bur-

rows on the inner-surface of the bark, consisting of numerous galleries radiating in all directions from a central chamber. (See *BARK-BEETLES*.)

In combating wood-boring beetles the method must be suited to the habits of the particular species, but in general all infected wood should be burned or the larvæ picked out and destroyed. Egg laying should be prevented as far as possible by painting the tree trunks with soap-suds, kerosene emulsion, or similar repellent. Woodpeckers perform a valuable service in the destruction of these larvæ.

Consult: Harris and Flint, 'Insects Injurious to Vegetation' (New York 1884); Packard, 'Insects Injurious to Forest and Shade Trees' (Washington 1890); Leconte and Horn, 'Coleoptera of North America' (Washington 1883); Thompson, 'Systema Cerambycidarum' (Paris 1865).

Wood Carving, sculpture in wood, either in low relief or in the round. On the whole the grain and structure of wood make it more suitable for carving in relief than for large statues; some woods without much distinct grain can be carved almost as marble or stone; in other woods the artist must carefully adapt his design to the grain of the wood. Wood used for carving must be carefully seasoned and specially prepared; one method of seasoning it is to soak it, when newly cut, in running water, thus washing away all the sap, and then to dry out the water; an ancient method was to smoke it with wood smoke; still another method is to dry the wood in hot rooms, after pieces of paper have been glued on the ends to prevent the sap from drying out at the ends too rapidly. The woods most commonly used for carving are oak, chestnut, walnut; cedar in ancient times; sandalwood and other perfumed woods in the East; pine, fir, and similar soft woods; the last mentioned being especially fitted for carving on a large scale.

History.—Wood carving has occupied an important place in the early development of the fine arts in most nations; though it was almost unknown in Babylonia, Assyria, and Persia, it was common in Egypt in early times, in India, in China, and in Japan; and is now practised by many savage and semi-savage races. Particularly the Maori and Polynesian races use an abundance of wood carving, not only on the walls and beams of their dwellings, but also on their paddles, weapons, etc. Their representations of beasts and men are usually grotesque, but they also carve complicated geometrical figures, spirals, etc., of real beauty and freedom of design. The oldest example of wood carving which is now preserved is Egyptian, a life-size statue of a man known as the Sheikh-el-Beled, dating from 4000 B.C., which gives evidence of marked technical skill; several other smaller pieces of Egyptian carving are also preserved. No specimens of Greek and Roman wood carving have been preserved, but the classical writers leave no doubt that wood was used in the early days of art in both Greece and Rome, and many of the sacred statues were undoubtedly of this material. Wood carving reached its highest development in the Middle Ages. The best early specimens of mediæval carving are found in the Scandinavian countries, on several church doorways, dating from the 9th to the 13th centuries; these are carved on pine, and

WOOD DUCK—WOOD ENGRAVING

the designs consist mostly of interlacing scroll work, combined with figures. The art reached its highest point in France, Germany, England, and Italy in the 14th and 15th centuries. The best examples are found in the furnishing of churches, the pulpits, choir stalls, altar screens, etc. The most careful attention to detail, and artistic combination of figures, leaf and scroll work, combined with dignity of design, mark the best mediæval wood carving. Wood was used for the images of saints, and for effigies on tombs; and also for larger pieces of carving, such as roofs of churches and other edifices, often richly decorated with figures or foliage designs. In the Renaissance period wood carving was lavishly used in church decoration, choir stalls, confessionals, desks, and pulpits; in Italy ceilings were also elaborately carved; but the designs though elaborate and skilfully worked out, began to lose the dignity of the mediæval carvings, and to indicate a low ebb of taste. In modern times the art of wood carving has lost entirely its former importance. It is best developed among the Swiss peasants, where it is a regularly organized business; and is to some extent preserved among workmen in the provincial towns of France. In Switzerland it is used mostly for clocks, small articles of furniture, toilet articles, etc. In England and the United States wood carving has recently been revived to some extent as a valuable part of art training or of general manual training.

Consult: Jack, 'Wood Carving, Design and Workmanship' (1903); Williams, 'History of the Art of Sculpture in Wood' (1835).

Wood Duck, or **Summer Duck**, the most beautiful of American ducks (*Aix sponsa*). The bill is very high at the base, shorter than the head; nail very large and much hooked; head crested; tail short, wedge-shaped. The head and crest are metallic green, glossed on the sides with purple; line through the eye; two bars on side of head meeting under the chin, and upper throat, white; lower neck and sides of tail purple, the former with triangular spots of white; lower parts white; sides yellowish banded with black and posteriorly with white; speculum bluish green, tipped with white; primaries silver white externally at tip; back uniform, with bronzed and green reflections; a white crescent in front of wings bordered with black; scapulae and inner tertials velvet black with violet gloss. In the female the back is more purplish, the sides of head and neck ashy, about the bill white, and lower neck brownish; the eyes are red. It is 19 inches long, and 29 in alar extent. In most parts the plumage is iridescent with changing metallic reflections.

Formerly the wood duck, one of the most characteristic birds of our fauna, was abundant and widely distributed through the wooded and watered portions of the United States and southern Canada, but as a result of an unwholy warfare it has become practically extinct over large areas. It is confined to fresh water, especially secluded ponds in woods. The flight is noiseless, very rapid, graceful, and as easy among the branches of trees as that of the wild pigeon. It breeds from April to June, according to latitude, the nest being made in the hollow of a tree, or in the deserted excavations of the woodpecker or squirrel, and usually in deep swamps, though often in the vicinity of houses, for they are not shy birds. The eggs are 6 to

15, 2 by 1½ inches, pale buff and greenish, smooth, and laid on dried plants and feathers. They are much attached to the breeding places. The young leap down, or are conveyed to the ground or water by their parents. The adults are excellent divers, and feed on acorns, nuts, grapes, berries, rice, insects, snails, tadpoles, and small fry. The chief enemies of the adults are minks, raccoons, and snakes, and many of the young are destroyed by snapping turtles, alligators, and predaceous fishes. It is easily domesticated and readily breeds in captivity. The only other species of the genus is the famous mandarin duck (q.v.) of China.

Consult Grinnell, 'American Duck Shooting' (New York 1902).

Wood Engraving. Wood engraving is especially distinguished from other methods of engraving in being a relief process. In the early days of the art the design was drawn on the block in simple outline and the work of the engraver was to cut away the rest of the wood, leaving the lines of the drawing in relief, which when inked could be made to give an impression in facsimile if a piece of paper were put over

St. Christopher, the earliest wood engraving—size of original 11½ x 8½. Date 1423.

the block and pressure applied to the back. In its modern practice which involves reproduction by tones or tints, the varying values of an original are obtained by the most delicate cutting of lines and dots and minute picks. Blacks are obtained by leaving the wood untouched, pure whites by cutting the wood entirely away. Before the discovery of a method by which drawings could be photographed directly on the wood the design had to be drawn in reverse on the block and the same size as the finished print. By the use of photography the drawing can be

WOOD ENGRAVING

made any size and the reduction made in transferring to the block.

If to the art of printing we owe an inestimable debt for bringing to us the record of the thought and history of all times, to the kindred and older art of the wood engraver we owe almost equal obligations. It gave to the common people the pictures by which they could be made to understand the purport of written and printed words. When and where the art of wood engraving was first invented and by whom

vention of printing, when books in manuscript only were the treasured possessions of the great monasteries, these prints were of inestimable value in the cause of popular religious education. From the very first wood engraving has been an art for the people. In the beginning serving religious purposes only it soon became a means of satire and comment upon the abuses of the clergy and a record of the manners and customs of the times.

In the early part of the 15th century many minds were striving toward the invention of a way to print from movable types. The idea came no doubt from the so-called block books. Many of the early prints bore the name of a saint or a short legend which was evidently cut on the block with the picture. From these legends it was a natural step to extend the text and add whole columns of type. The date and place of the earliest of these block books is a matter for conjecture, but they were known in the early part of the 15th century. One of the most widely discussed of these is the 'Biblia Pauperum,' or Poor Preacher's Bible, several editions of which are known. It is a small folio containing 40 pages printed on one side only in a pale brownish ink by means of rubbing on the back. Each page is divided into five compartments separated by pillars, suggesting the idea of church windows. The central panel shows a scene from the Gospels and on the sides are illustrations from the Old Testament bearing on the central design. There are also texts and Latin verses. Another block book that has given rise to much speculation is the 'Speculum

The Grief of Hannah, from the Cologne Bible, about 1475.

has long been a much discussed question. The earliest known examples date from the early part of the 15th century when in various parts of northern Europe, notably in Germany and the Netherlands, there existed various rude prints representing scenes from Scripture and the lives of the saints, evidently made from wood cuts. They were printed in a brown ink apparently by rubbing on the back of the paper with some blunt edged instrument and were often colored either by hand or with the use of a stencil.

One of the most famous of these, and the earliest dated print from a wood block is the famous Saint Christopher of 1423 found pasted in the cover of a manuscript discovered in the library of a convent in Swabia. It represents Saint Christopher wading across a stream with the infant Jesus on his shoulder. On the right bank a hermit is kneeling before his cell holding a lantern in his hand, on the left a peasant is climbing a steep hill on the way to his home. It is a rude cut without any regard for perspective, but the figure of Saint Christopher possesses a certain dignity, and the pictorial effect is such as would appeal to a primitive people. Many similar cuts were produced in the 15th and 16th centuries in the cities of Augsburg, Nuremberg, Ulm, Cologne and the Flemish cities. Conventional in design and often repeating again and again the same subjects, they were yet expressive of the mediæval religious conceptions and were no doubt highly effective in giving particular and comprehensible value to the biblical lessons they were intended to convey.

It has been contended by some authorities that wood engraving really began with the invention of playing cards, but no authentic records are available of their having been printed before 1423, the date of the Saint Christopher, and they appear to have been made with a stencil. The making of sacred prints very soon developed into a large business, and by the middle of the 15th century wood engraving was an established and widely familiar art. Coming before the in-

The Fall of Lucifer, from the Speculum Humanæ Salvationis.

Humanæ Salvationis,' or The Mirror of Human Salvation.' In this the text appears to have been printed from movable type in black ink on a press. Other famous block books are the 'Apocalypsis Sancti Johannis,' Visions of Saint John; 'Ars Moriendi,' The Art of Dying; 'Canticum Canticorum,' or a History of the Virgin prefigured in the Song of Solomon. All of

these are curiously and often grotesquely medieval, full of the symbolism and mysticism of primitive humanity. Rude as they are, though, they were preparing the way for something better.

With the advent of printing the block books were superseded and wood engraving became

In France wood engraving was early identified with printing. Religious books contained many curious and often beautiful illustrations. Those known as the 'Livres d'Heures' often contained many fine examples of carefully executed blocks in imitation of miniatures. Many of these early wood cuts served simply as an outline for the colorist, who often overlaid them with an entirely different design. The first really effective artistic use of the decorative border may be seen in these 'Livres d'Heures,' and some of them are notably quaint embodiments of scriptural ideas combined with others that are certainly not to be found in the sacred book.

England lagged behind other countries in her art development, and wood engraving was little known there before the publication of Caxton's 'Game and Playe of Chess,' published in 1476, and it is thought that the cuts in this were imported from Germany. In Italy the earliest wood engravings were either importations from Germany or were suggested by German originals. The most noted example of early Italian wood engraving is the 'Hypnerotomachia Poliphili,' or Dream of Poliphilo, written by a Venetian monk in 1467 and printed by the famous Aldus in 1499. The Italians developed a method of engraving in *chiaroscuro*, in imitation of painting, by the use of several blocks, each printed in a different color. The Germans also employed the same methods, but in a much cruder form.

With the advent of Albrecht Dürer wood engraving reached its highest attainment. First of all he was a great designer with a far-reaching and powerful imagination and a mind full of the new learning and spirit of the coming Reformation. He was the first fully to realize

The Ploughman, from the Dance of Death, by Holbein.

a handmaid of the greater art. Illustrations are to be found in many of the books of the early printers. (This is not the place to discuss the question of who was the first to use movable type and the subject has already been treated under the head of PRINTING.) The earliest wood engravings in a printed book with an authentic date appear in the *Psalter of Faust* and Scheffer published at Mentz in 1457. From Cologne, Mentz, Nuremberg, Ulm, Augsburg, Strasburg and Basel came many printed books illustrated with wood engravings.

The Bible was the book on which the early printers spent most of their energies. Numerous editions were published with illustrations. The most important of these was the famous Cologne Bible which appeared before 1475. Its 100 designs were, after the block books, the first illustrations of Scripture, and they showed more originality and invention than anything that had gone before. Many of the decorative borders of this Bible are in curious contrast to the sacred text. Next to the Bibles in interest in the study of wood engraving are the numerous chronicles and histories. These are records of legends and imaginary events and are illustrated with wood cuts dealing with the lives of the saints and the great happenings in local history. One of the best known of these chronicles is the one published at Nuremberg in 1493. It has over 2,000 cuts supposed to be the work of William Pleydenwurff and Michael Wohlgemuth, the latter a master of the great Dürer. The chief distinction of the Nuremberg Chronicle lies in the fact that in it for the first time wood cuts were printed in simple black and white. They were modern in this respect and in the use of cross hatching by which grays and blacks of varying intensity were obtained by engraving lines that crossed each other at different intervals.

The Savages of Calicut, from the Triumphal Procession, by Burgkmair.

the great possibilities of wood engraving, and by his influence it was raised to the dignity of a fine art. He is known chiefly by four great works. The first of them the 15 large drawings illustrating the Apocalypse of Saint John. Others are the 'Larger Passion of Our Lord,' 12 cuts, 'The Life of the Virgin,' 20 cuts, and the 'Smaller Passion of Our Lord,' 36 cuts.

Among Dürer's other famous works are the 'Car and Gate of Triumph' made for the Emperor Maximilian. Another great work celebrating the emperor's fame was Hans Burgkmair's magnificent 'Triumphal Procession,' etc.

A group of wood engravers known as the Little Masters, from the small size of their work, followed Dürer, but their work is of no special significance.

Hans Holbein ranks among the really great artists and wood engraving owes to him a still further advance. Holbein indeed might be well called the father of modern illustration. Among the first books he illustrated were the 'Utopia' of Sir Thomas Moore and the Biblical translations of Luther. He is best known, however, for his remarkable series of designs known as the 'Dance of Death,' a popular subject of mediæval times. In each of the 41 designs is a scene from common daily life expressed with a grim dramatic power and truth of drawing that are remarkable in a very high degree. Death spares neither the king nor the peasant, the praying nun nor the priest in the pulpit. Much of their success was due to the wonderfully accurate wood engraving of Hans Lützelburger, for in the hands of a less skilful engraver the originals would have lost much of their power. Holbein's designs for the Old Testament were also remarkable in many aspects, but they were more conventional in conception. After Holbein, wood-engraving as an art steadily declined.

Its revival, in a modern sense, began with the work of Thomas Bewick in England. To him we owe the great principle of the white line which did away with much of the old drudgery and gave the engravers more freedom in handling. In the old way where black lines crossed the little white lozenges between had to be laboriously cut away, Bewick simply gouged out with his graver a line and by varying the width and number, obtained his gradation of light and shade. He was the first also to use boxwood and the burin; the old wood engravers cut their designs on pear or apple tree boards with a knife. Bewick is best known by the drawings and engravings in his 'British Quadrupeds' and 'History of British Birds.' He was the founder of the modern British school which held for many years a distinguished place in modern illustrative art. Bewick's pupils, Nesbit and Luke Clennell; Robert Branson, John Thompson, the Dalzels, William Harvey, and W. J. Linton engraved the work of many distinguished English artists. In France and Germany wood engraving has maintained a distinct place in spite of process and some of it has been and still is of a very high order of merit. It is to America, however, that we must look for the greatest achievement in wood engraving. Our artists have carried it to a degree of perfection unparalleled anywhere else in the world. They have taken it out of the domain of a largely mechanical handicraft and given it almost the individuality that belongs to creative art. The first American wood engraver of distinction, Dr. Alexander Anderson, was a follower of Bewick. His work appears in many early American books. Joseph Alexander Adams was another early American wood engraver whose work was even more worthy of study. The notable wood engravings made for the Harper Bible published in 1843 were done under his supervision.

To the great English and American magazines we owe the incentive and the opportunity for the development of the best wood engraving. Even before a way was discovered by which drawings might be photographed on the block, American engravers had begun to show their capacity for interpreting the lines and tones of drawings with exceptional accuracy and originality. In some instances attempts were made to copy the qualities of brush marks and the textures of different mediums such as pencil and charcoal, etc., but this was only a passing phase of an attempt at superior cleverness. W. J. Linton who spent the later years of his life in America was a leader in the effort to make wood engraving more of an individual art, and though he was not always in full sympathy with the tendency toward a greater refinement of line and an effort that seemed to him to be leading away from the legitimate purposes of wood engraving, he was a very great power for good. J. G. Smithwick, long identified with the art department of 'Harper's,' and A. W. Drake, of 'Scribner's Monthly' and the 'Century,' did their full share in the development of the art. Frederick Juengling, J. P. Davis, Frank French, F. S. King, Wm. B. Closson, Henry Wolf, Thomas Cole, Thomas Johnson, Elbridge Kingsley, Gustav Krueh, William Muller and others are names identified with the highest attainment of American wood engraving. With the advent of process (see PHOTO-ENGRAVING) the demand for wood engraving has greatly diminished and its employment as a reproductive art is constantly decreasing. It is a beautiful art as exemplified by the best practitioners, remarkable for its brilliancy of effect in pure black and white, requiring the most delicate skill in its manual execution and a feeling and invention with respect to the correct interpretation of values and textures of a very high order.

With the passing of the men of to-day who have given wood engraving a place among the fine arts, it is likely that it will cease to be a field for further endeavor. There are no longer incentives for its study, and the time and artistic training necessary for any real accomplishment can be put to much better profit in other directions. Prints by famous engravers are already much sought by collectors, and the future historian of the art will probably end his record with the close of the 19th century and the beginning of the 20th.

More than to any other of the graphic arts are we indebted to wood engraving. It led the way to the invention of printing and has been the means of putting before the world a record of the progress of the greater arts of drawing and painting.

JAMES B. CARRINGTON,
Assistant Editor 'Scribner's Magazine.'

Wood-frog. See **FROG**.

Wood-ibis, a kind of stork (q.v.).

Wood-lark, a European lark (*Lullula ar-borea*) closely allied to the sky-lark (q.v.), but distinguished by its smaller size, shorter tail, a distinct light streak over the eyes and ears, and more distinct markings on the breast. It perches upon trees, and is found chiefly in fields near the borders of woods. Its flight is much less extensive and powerful than that of the sky-lark. The wood-lark often sings during the

WOOD-LOUSE—WOOD-SORREL

night, and on this account has been mistaken for the nightingale. "Its song" is described as "sweet and flute-like, more melancholy than that of the sky-lark, and is generally uttered from the top of some tree or else when the bird is on the wing. It rises to some height before commencing, then ascends, singing, higher and higher, throwing itself from side to side, hovers and floats in the air, and when the song is ended drops with closed wings to the ground again." It bears confinement well, singing sweetly in the cage, and even breeding easily there or in an aviary: hence it is constantly caught and kept. The nest is generally built under bushes. The eggs are five in number, of a dusky color, spotted with deep-brown spots.

Wood-louse, one of the little isopod crustaceans (see *Isopoda*) of the family *Omniscidae*, which abound underneath logs and in decaying stumps in the woods, and which, when touched, curl up for protection like armadillos. They are numerous and hardy, the sexes are distinct, and the young are hatched from the eggs in their full form, passing through no metamorphoses.

Wood-mouse, the red-backed mouse (q.v.). In England the long-tailed field-mouse (*Mus. sylvestris*) is so called.

Wood Nymph, a minor pagan divinity supposed to live in trees and woods. This is the common name, also, of the beautiful lepidopterous insects comprising the genus *Eudryas*.

Wood Oil, the name given in commerce to a resinous juice which exudes from various trees of eastern Asia. It has a fine aromatic color, and is used for a great variety of purposes; in medicine as a substitute for copaiba balsam; by sailors for paying the seams of a ship instead of tar; by painters as a varnish; also in the making of lithographic ink, etc. It is an excellent preservative of timber against the attacks of white-ants. It is strictly an oleo-resin, and is also known as gurun balsam.

Wood-pewee. See **PEWEE**.

Wood-pulp. There are three kinds used—ground wood, soda-process wood and sulphite-process wood; the latter two are not wood in either physical or chemical properties, but cellulose, similar to cotton-fibre in appearance and nature. (See **PAPER**; **PAPER INDUSTRY**.) The name of wood-pulp is generally understood as designating mechanically ground pulp as distinguished from chemical pulp, or cellulose. In the manufacture of mechanical wood-pulp a block of wood is put against the surface of a rapidly revolving grindstone by hydraulic or other pressure, a stream of water pouring down upon the stone carrying away the disintegrated fibres into a stuff-chest, where they are mixed with a percentage of sulphite or other cellulose, and are then ready to go on the paper machine to be converted into paper. Spruce principally, but also poplar and other soft woods are used in the manufacture of this pulp.

Ground wood was invented in Germany in 1847 by Kelter and perfected and patented by Henry Voelter, who constructed a machine which is in general use to-day. Mr. Albrecht Pagenstecher, of New York, bought and controlled the Voelter patent and introduced this industry into the United States in 1867-68, importing two machines, which were set up in Curtisville, Mass.

The introduction of this new process marked a new era in the manufacture of paper. It furnished a cheap and abundant raw material, simplified the former complicated methods of preparing stock for paper machines, and improved the quality of the paper made, besides cheapening the cost of production. Without wood-pulp it would be impossible to supply the demand for paper at the present day.

Wood-pulp was first sold at 8 cents per pound, but finally dropped to less than 1 cent per pound, and brought the price of newspaper from 14 cents in 1868 down to less than 2 cents per pound at the present time, making the one-cent newspaper of to-day possible.

The introduction of ground wood-pulp printing paper into rolls completely revolutionized modern methods of journalism. The absorbent quality of this wood-pulp paper made the modern rapid printing press practicable, eliminating the allowance for drying and limiting the printing speed only by the mechanical possibilities of the press, which were in no way dependent, as in the case of rag paper, upon the drying of each sheet. Such an improvement made immediate changes in the making and printing of newspaper, and as soon as the results of this new process became commercially practicable, the entire system of news gathering changed as well. It has since become possible for a paper, with the help of the modern type-setting machine, to get news into the streets within fifteen minutes after its receipt in the printing office.

The output of wood-pulp, which in 1868 was less than one ton per day from the only mill then in existence, has now increased to over 5,000 tons per day in 188 mills, requiring in its manufacture nearly 2,000,000 cords of wood annually, and the use of water-power amounting to about 400,000 horse-power.

The introduction of this new process was made under many difficulties, the greatest of which was to overcome the prejudice of paper-makers, who believed that rags were the only fit substance to make paper of, and considered wood-pulp as an adulteration or shoddy. At present every newspaper is composed largely of ground wood-pulp, with a small percentage of chemical fibre. Many book, wrapping and other papers also contain a large percentage of ground wood-pulp.

ALBRECHT PAGENSTECHER,
President Manufacturers Paper Company.

Wood-quail, or **Roulroul**. See **QUAIL**.

Wood-rat, a large rat-like wild mouse of the genus *Neotoma*, of which two species dwell in the forests of the southern half of the United States. The body is 8 or 9 inches long, and the tail nearly as long. The form resembles that of the white-footed mouse (*Microtus*), the animal being more slender and squirrel-like than are the true or house rats, from which this may always be distinguished by his hairy tail, softer fur, and much larger ears. The best known species is the Alleghany wood-rat (*N. pennsylvanica*), which is lead-color above, sprinkled with black hairs, which lightens to yellowish on the flanks and becomes pure white on the abdomen and feet. Consult Stone and Cram, "American Animals" (New York 1902).

Wood-robin, the wood-thrush (q.v.).

Wood-sorrel. See **SORREL**.

WOOD-THRUSH — WOOD-WORKING MACHINERY

Wood-thrush, or **Wood-robin**, the most familiar of North American spotted thrushes (*Hylochichia mustelina*), famous for the rich four-parted melody of its spring song. It is numerous in warm weather throughout the Eastern States and Canada, inhabiting the wild spaces as well as confidently approaching the house and roadside. Its nest is often built in a village shade-tree, or even in a garden bush, but more frequently among the forking twigs of an apple-tree; and it is to be distinguished from that of the robin by the absence of mud and the presence of many dead leaves, which always form the principal part of its foundation. The eggs are deep blue, smaller and less greenish than those of the robin. It soon becomes unsuspicious of the persons whom it is accustomed to see about the place and who do not disturb it, but is jealous of the attention of other birds, and defends its home with admirable vigor and

Wood-working Machinery includes the various machines employed to reduce the lumber cut in the forests into doors, sashes, moldings, etc., used for industrial purposes. They may be conveniently divided into four general classes—saws, which operate by rending or scission; planers, by which the work is accomplished by a paring action; lathes, in which the wood is turned or pared while being revolved; and grinders or abrading machines, which are generally employed as finishers, and accomplish the work through the medium of sand or emery. Saws are blades of steel with toothed edges and are used to divide metal, and stone, but the principal modern use of the saw is to divide wood. For saws used in metal-working see **METAL-WORKING MACHINERY**. The use of saws is of very ancient origin, and it is practically impossible to enumerate in detail their adaptations to various mechanical processes.

Gang Saw.

success. The song, which is heard most frequently and pleasingly toward sunset, is excelled by that of none of the more familiar Eastern birds either in musical quality or in sentiment. It is low, sweet, evenly modulated, and flute-like, yet has far-carrying power, and when heard at twilight across the fields, or from unseen recesses of the orchard, it brings to the mind a hymn chanted in praise of the serenity of the summer evening. This thrush is bright cinnamon above, brightest on the head; below white, with large rounded black spots forming lines down in front.

Wood-warbler, a book-name for the small and beautiful American birds of the family *Mniotiltidae* (see **WARBLER**); but the name is without special significance, as these birds are not more characteristic of woodland than of other places; nor than other warblers.

Among uncivilized peoples, saws were made of flakes of flint imbedded in wooden blades and held in place by means of bitumen. Later, among the ancients, bronze saws were used, but all modern saws are made of steel of the finest quality. The saw is practically an exaggeration of the knife, the edge of which, although presenting a smooth appearance to the unaided eye, shows an array of saw teeth when viewed under a microscope. Saws are of four general types—"straight," with flat blades and straight edges, reciprocating in action, and making a plain cut; "circular," with flat circular blades, and cutting at right angles to the motion which is continuous; "barrel," cylindrical in shape, and cutting parallel to the axis; and "band," endless ribbons of steel, toothed on one of the edges, and running over two pulleys, one above the other, with a continuous cutting motion parallel to the axis.

WOOD-WORKING MACHINERY

Any of them may be designed for cross-cutting or for ripping purposes. In the cross-cut saws the teeth are designed to cut at right angles to the fibre of the wood, while in the rip-saws the alternate teeth are bent outwardly or "set" so that they make a broader gash than the thickness of the blade and prevent binding or sticking. Saw teeth are made long or short, and pitched to cut one way or both ways, according to the kind and character of the timber to be sawn. The "pitch" of a tooth is the angular position of its point relative to the edge of the

increased rigidity is obtained only by an increase in thickness, which in turn results in the cutting of a wide gash, and a consequent increase in the kerf-waste or saw-dust. Therefore, the use of saws exceeding 72 inches in diameter is not considered economical. In operation, they are run at speeds ranging from 5,000 to 9,000 feet per minute, and are capable of cutting, on the average, about 80,000 superficial feet of lumber per day of 12 hours, as against 6,000 to 10,000 feet, by the straight saws. The wear on circular saws is very great, and the

Circular Saw, with Rack-feed.

blade, and it is determined by subtracting the angle of the back edge from that of the front edge of the tooth. The normal pitch is 60° , which is generally applicable to all saws, from those used in the largest sawmills to the smallest hand saws. The blade of the hand saw is broader at one end than at the other, and is provided with a wooden handle attached to the broader end. The largest straight saws are called "pit-saws," and were the earliest employed in the manufacture of lumber. They were operated by two men, one standing over the log and drawing upward, while another standing in the pit below followed with the downward or cutting stroke. The demand for larger quantities of sawmill products, developed the arrangements known as "gate," "gang," and "muley" saws, and later the "circular" saws, which were introduced in England about the close of the 18th century. The first patent was granted to Samuel Miller in 1777, but a general announcement of the principle appears to have been made by Brunel about 12 years later.

The circular saw is a disk of the finest steel, with teeth on its edge. At first only those of small diameter were used, such as the buzz-saw of the watchmaker, for minute work, and the ripping-saw of the carpenter shop and the planing mill; but now they are made in diameters ranging from 1 to 84 inches, and the larger sizes are used as the main saws of most of the larger sawmills. In the principal lumbering districts of the United States, they are usually 72 inches in diameter, while those employed on the Pacific coast often run up to a diameter of 8 feet. In design, the diameter of a circular saw is governed by its rigidity or the capacity to maintain a true plane of rotation during the process of cutting. This property decreases as the diameter increases, which is exactly the reverse of what is required. In-

teeth of the larger lumber saws require to be filed sharp three or four times during a day's work, which rapidly reduces the diameter of the saw, and seriously impairs its efficiency. To obviate this, the larger saws are often constructed with removable teeth which are inserted in slots in the periphery and held in place by wedging or by rivets, and as they wear

Band Saw.

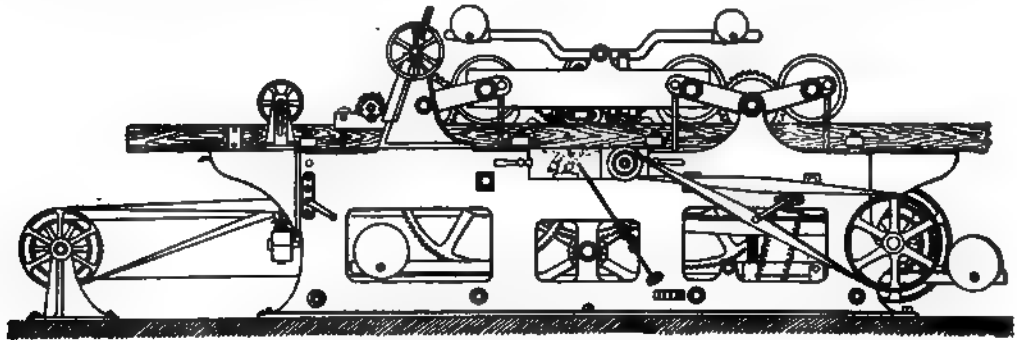
out are easily replaced by new teeth, at a comparatively small expense. Barrel saws are metal cylinders shaped like a straight-sided barrel open at both ends, and with the edge of one end toothed. They are employed in manufacturing the staves for barrels, pails and tubs. Band

WOOD-WORKING MACHINERY

saws were invented about the beginning of the 19th century, and although their particular merits were known long before the circular saws came into general use, they were not adopted until the latter part of the century, owing to the difficulty of making saws capable of withstanding the severe service. But, with the manufacture of the finer grades of steel of greater tensile strength and elasticity, since 1885, they have been adopted in addition to the circular saws in many of the larger mills. They are made in sizes ranging from $\frac{1}{2}$ inch in width,

cut various ornamental designs for brackets, corner-pieces, clock-cases, etc.

Of saws used for special purposes, the segment saw used for cutting veneers, and the wire saw employed for cutting stone, are interesting as examples of the application of the tool for exactly opposite purposes. The segment saw is circular in shape, and is formed by bolting the segments of the blade, which are extremely thin, upon the outer edge of a strong cast-iron centre, which gives the required rigidity. The larger sizes range from 6 to 8 feet in diameter,



Planer, with Roller-feed.

used for ordinary shop-work, to from 6 to 8 inches in width, for the use of the larger lumber mills. In mode of operation, which is as that of a belt over two pulleys, they cut with a continuous motion, with the toothed edge always in the gash. Being made extremely thin, they are used for continuous and rapid cutting in planing mills and other wood-working plants, where the cuts are made in scrolls and curves, and require

and possess cutting edges so light, that they are capable of cutting veneers almost as thin as a sheet of paper. The wire saw, on the other hand, is a form of band saw, and consists of an endless strand of three steel wires which is kept moving upon the stone while sand and water are fed to it. The grains of sand are caught in the spaces between the wires and are dragged along, and by abrading the surface

Copying Lathe.

a very flexible blade. The thinness of the blade insures a much smaller kerf-waste than that resulting from the circular saw, and as installed in their larger forms in the lumber mills are capable of sawing an average of 40,000 feet of lumber per day. The saws commonly known as scroll saws and jig saws, are very narrow straight blades of steel, often as fine as $\frac{1}{16}$ of an inch in width, which are operated to give a reciprocating movement, and are employed to

result in cutting a groove. The wires are kept constantly pressed against the bottom of the groove by the aid of two pulleys, one on each end of the cut. When the cut is vertical, the pulleys are placed on suitable forms in small pits, and are so arranged that they can be fed downward by the means of screws. Planers are used to reduce lumber to exact dimensions by smoothing down the rough surfaces of the product of the sawmills. In the surface planer this

WOOD-WORKING MACHINERY

is accomplished by a series of revolving cutters which pare off shavings and leave the surface of the timber quite smooth. The cutters are very ingeniously arranged, and in many cases all four sides of the board or beam are planed down, and the tongue and groove cut in the edges, at one operation. The cutters may be so arranged as to produce curved surfaces by following a pattern, and are extensively used in the manufacture of moldings, panels, etc. To this class also belong the dove-tailing machines in which the cutters are arranged in gangs, similar to a gang of chisels, or revolve upon a vertical spindle. They cut out the tongues and spaces automatically. Wood-working lathes are similar in principle to those employed in metal-working. The piece of wood is held between the stocks of the machine and revolved rapidly, while a chisel or other tool is pressed against it and removes a shaving by a combined paring and severing action. By the use of various automatic duplicating attachments in conjunction with patterns, as in the case of the Blanchard lathe, in which patterns and blanks are revolved together, exact facsimiles are readily obtained, and the output of the machines greatly increased. Other machines involving the lathe principle, are the various kinds of borers, for drilling holes; tenoning machines and mortising machines, for making tenon joints and the mortises to receive the tenons; and gaging machines for cutting grooves. Abrading machines are of two kinds—those in which an endless belt coated with sand or emery is brought in contact with the work, generally of small dimensions; and those in which a drum similarly coated is employed to work down large surfaces. See also SAWS AND SAW-MAKING.

Practical Suggestions.—The very important place occupied by the circular and band saws among the various classes of wood-working machines demands a few practical suggestions and rules relative to their use, care, and management. The principal points to be observed in this connection are as follows:

Hanging the Saw.—Circular saws should always be hung upon the mandrel with the side marked "log side" next to the log on the mill, and should be perfectly plumb when the flanges have been screwed up. Thin saws and saws driven at high speed should be put up very open in order to allow the centre to pull through. These saws when hung on the mandrel may be concave or convex on the log side when at rest, but when running at the speed for which they are hammered they should straighten up and be flat on the log side. The difficulties resulting from too much crowning or dishing on the log side may be overcome by the use of suitable paper rings placed between the saw and the collars, so that when the saw is clamped between the flanges it will be brought to the proper position.

Lining the saw with the track.—The track should be solid, level, and straight, and should be put down by careful measurement so as to be from one-eighth to one-quarter of an inch further from the saw at its centre than at a distance of 20 feet from it. Some saws require more inclination toward the track than others in order to hold them to their work on

the log, and if the track is properly adjusted any small variations from the required inclination may be effected by means of the set screws on the box.

The *lead* or the holding of the saw to its work may be adjusted by its position to the track as already described, or by beveling on the back of the teeth. Assuming that the teeth are properly filed perfectly square in front, then bevel filing on the back of the teeth on the board side will lead the saw into the log, and bevel filing on the log side will lead it out of the log. A "snaky" or in and out lead indicates that the rim of the saw is too large for the centre and, therefore, requires to be opened out at the centre. This may be effected by running the saw warm at the centre by creating friction, by reducing the set or spread of the teeth, or by hammering between the centre and the rim.

Motion.—The motion of circular saws is one of the conditions which requires the most careful attention. The saw should always be run at a speed approximating as nearly as practicable to a periphery speed of 9,000 feet per minute, and it should be run at a uniform speed both in and out of the cut. Excessively high speeds generate heat in the saw and make it so touchy and limber that it will do good work only on light feed and while the teeth are in the best of condition; but, when the teeth have lost their sharp edge, the saw will dodge whenever it runs against the slightest obstacle. Speeds too low are also objectionable, but they do not produce such ruinous effects upon the saw. These difficulties may be partially remedied by the hammering of the saw, but it is impossible to overcome them completely by such means. The accompanying table gives the proper speed of circular saws of varying diameter. It is calculated on the basis of a periphery speed of 9,000 feet per minute. As a general rule, however, saws for portable mills are usually run at a speed of 450 revolutions per minute, and those for steam feed mills from 600 to 900 revolutions per minute.

TABLE OF SPEED OF CIRCULAR SAWS.

Diameter Inches.	Revolutions per Minute	Diameter Inches.	Revolutions per Minute
8	4,500	42	870
10	3,600	44	840
12	3,000	46	800
14	2,585	48	750
16	2,250	50	725
18	2,000	52	700
20	1,800	54	675
22	1,636	56	650
24	1,500	58	625
26	1,384	60	600
28	1,285	62	575
30	1,200	64	550
32	1,120	66	525
34	1,050	68	500
36	1,000	70	475
38	950	72	450
40	900		

The three following rules may be readily employed for calculating the speed of saws, pulleys, or drums.

1. To find the number of revolutions of the driven when its diameter is known

Multiply the diameter of the driver by its number of revolutions and divide the product by the diameter of the driven; the quotient will be the number of revolutions of the driven.

2. The diameter and revolutions of the driver

WOOD-WORKING MACHINERY

being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time.

Multiply the diameter of the driver by its number of revolutions and divide the product by the number of revolutions of the driven; the quotient will be the diameter of the driven.

3. To find the size of the driver.

Multiply the diameter of the driven by the number of revolutions it is required to make, and divide the product by the number of revolutions of the driver; the quotient will be the size of the driver.

In the case of band saws the most important point requiring careful attention is the tension or the opening up or expanding of the centre of the blade so as to place the strain on the edges of the band. The tensioning of saws may be accomplished by the use of rolls, or by hammering, the last named method being preferable as the saws are liable to hold their shape much longer. The accompanying table shows the circles of tension for band saws of different widths and gauges. These figures give the saw as much tension as it will take and lie flat on the running-board, a condition which accords with the best practice.

CIRCLES OF TENSION FOR BAND SAWS.

Width, Inches.	Gauge.	Circle Feet.
6	16	26
6	17	26
6	18	26
6	19	30
6	20	30
7	15	30
7	16	30
7	17	30
7	18	30
7	19	35
8	14	30
8	15	30
8	16	30
8	17	35
8	18	35
9	14	30
9	15	30
9	16	30
9	17	35
10	14	30
10	15	35
10	16	40
11	14	40
11	15	45
12	13	40
12	14	40
12	15	45
13	13	50
13	14	50
13	15	50
14	13	50
14	14	50
14	15	55
15	13	55
15	14	55
16	13	60
16	14	60
16	15	65

It is often desirable that the toothed edge should be strained a little tighter than any other portion of the saw. This may be accomplished, and an uniform tension preserved by rolling or hammering the back of the saw to a curve showing about one-sixty-fourth of an inch rounding in five feet, and then tilting the upper wheel so that the saw has an uniform pressure across the blade. The strains usually put upon saws range from 5,000 to 12,000 pounds, and should be only sufficient to prevent slipping on the wheels. The

accompanying table gives the strains for band saws of different sizes and gauges.

TABLE OF STRAINS FOR BAND SAWS.

Width Inches.	Gauge.	Pounds.
6	16	4,212
6	17	3,756
6	18	3,174
6	19	2,718
6	20	2,268
7	15	5,439
7	16	4,914
7	17	4,382
8	14	7,168
8	15	6,316
8	16	5,616
9	14	8,064
9	15	6,997
9	16	6,318
10	13	10,260
10	14	8,960
10	15	7,770
11	13	11,288
11	14	9,856
11	15	8,547
12	13	12,312
12	14	10,752
12	15	9,324
13	13	13,338
13	14	11,648
14	13	14,364
14	14	12,544
15	13	15,390
15	14	13,440
16	13	16,416
16	14	14,336

Gauges.—In selecting a saw, the nature of the work for which it is required, and the power available to drive it, should always be taken into account. In this connection the first important point is the proper gauge. For mills of ordinary capacity and operating on a general line of work the most suitable saws are those measuring seven gauge at the centre and eight on the rim. If the timber is valuable, and the sawyer skillful, saws as light as eight by ten gauge may be used, but saws lighter than that are impracticable for use in ordinary mills. In large mills where the saving of time is more desirable than the saving of lumber, and consequently greater speed and feed are used, the most suitable saws are those of six and seven gauge, which are sufficiently heavy to stand up to the more severe service.

The second important point in the selection of a saw is the number of teeth. With high speed and the accompanying high feed, more work is required of the saw in a given time, and, therefore, it should have more teeth with which to do that work and to distribute the strain evenly. The number of teeth should depend not only on the thickness of the saw, but also on the character of the timber to be sawed and the speed and feed of the mill.

WILLIAM MOREY, JR., C. E.
Consulting Engineer, New York City.

Woodberry, wūd'bēr-ī, George Edward, American critic and poet: b. Beverly, Mass., 12 May 1855. He was graduated from Harvard in 1877, became professor of English in the University of Nebraska, in 1878-9 was on the 'Nation' staff, in 1879-80 was again at Nebraska, and subsequently, until 1891, was in active literary work, holding the literary editorship of the *Boston Post*, and contributing much to the 'Atlantic.' From 1891 until his resignation in 1904 he was successively professor of literature and of comparative literature (from 1899) in Columbia University. He became known as an

WOODBIDGE—WOODBURY

authoritative critic, and a poet of much distinction, and must be ranked among the most scholarly and important of the more recent American litterateurs. The titles of his works include: 'A History of Wood-Engraving' (1893); a very valuable 'Life' of Poe (1885); 'American Men of Letters'; 'The North Shore Watch, and Other Poems' (1890); 'Studies in Letters and Life' (1890); 'Makers of Literature' (1900); 'Nathaniel Hawthorne' (1902); 'American Men of Letters'; 'Collected Poems' (1903); and 'America in Literature' (1903). He also edited the poetical works of Shelley (1892); Poe's works (1894; with Stedman); Lamb's 'Essays of Elia' (1892); and Aubrey de Vere's 'Select Poems' (1894). He is also editor of the 'Journal of Comparative Philology.'

Woodbridge, William, American politician: b. Norwich, Conn., 20 Aug. 1780; d. 20 Oct. 1861. He removed with his father to Marietta, Ohio, in 1791, but studied law at Litchfield in his native State and in 1806 was admitted to the Ohio bar, becoming a member of the Ohio assembly the next year. A State senator, 1808-14, as well as county attorney, he was appointed secretary of Michigan Territory in 1814, was territorial delegate to Congress 1819-20, and judge of the supreme court of the territory 1828-32. In 1837 he became a State senator, was governor of Michigan, 1839-41, and a United States senator 1841-7.

Woodbridge, N. J., township, Middlesex County; on Staten Island Sound, and on the Central of New Jersey and the Pennsylvania R.R.'s; about 25 miles southwest of New York. It has regular steamer connection with New York. It has valuable deposits of fire-clay, and the chief industrial establishments are brick, tile, and drain pipe works. The township contains several villages. It has a high school, established in 1876, public and parish graded schools, and a public library. Pop. (1890) 4,665; (1900) 7,631; (1910) 8,948.

Woodburn, James Albert, American educator and historian: b. Bloomington, Ind., 30 Nov. 1856. He was graduated at the Indiana State University in 1876; taught in the preparatory department of that university from 1878 to 1886; from 1889 to 1890 was fellow in history at Johns Hopkins University; and since 1890, has been professor of American history in the University of Indiana. He has written 'Higher Education in Indiana' (1890); 'Causes of the American Revolution' in 'Johns Hopkins University Studies' (1891); 'The Historical Significance of the Missouri Compromise' in 'Reports of the American Historical Association' (1893); 'The American Republic and Its Government' (1903); 'Political Parties and Party Problems in the United States' (1903); the article 'United States—Political Events of the Civil War,' in the 'Encyclopedia Americana'; etc. He has also edited (with Prof. C. W. Hodgin) 'Select Orations of Burke and Webster' (1892); 'Lecky's 'American Revolution' (from Lecky's 'England in the Eighteenth Century'), with bibliography and notes; 'American Political History' (from Prof. Alexander Johnston's articles in Lalor's 'Cyclopedia of Political Science and United States History' 4 vols.); etc.

Woodbury, wūd'būr-ri, Daniel Phineas, American soldier and military engineer: b. New London, N. H., 16 Dec. 1812; d. Key West, Fla., 15 Aug. 1864. He was graduated from West Point in 1836 and was appointed second lieutenant of artillery. He was not long afterward transferred to the engineers and became first lieutenant in July 1838. After service to 1840 in constructing the Cumberland Road in Ohio, he took charge until 1847 of repairing works on the Atlantic coast. He was in charge of construction at Forts Kearny and Laramie, till 1850 and on the North Carolina coast till 1856. He became captain of engineers 1853, major 6 Aug. 1861, lieut.-col. Sept. and brigadier general of volunteers 19 March 1862. At the opening of the Civil War he was assigned for engineer duty in the Army of the Potomac and was active in planning the defenses of Washington. He controlled all the engineering operations in the siege of Yorktown and those before Richmond, and his prompt action at the battle of Fredericksburg in bridging the Rappahannock, won for him the brevet of brigadier-general in the regular army. While in command of the Key West district he died of yellow fever. He published 'Sustaining Walls' (1845); 'Theory of the Arch' (1858).

Woodbury, Isaac Baker, American musical editor: b. Beverly, Mass., 1819; d. 26 Oct. 1858. Having studied music for a year in Europe, he returned to the United States and taught music in the schools of Boston until his removal to New York in 1845. He then became editor of the 'Musical Review' and of the 'Musical Pioneer.' He is most widely known as the compiler of church-music books and glee-books, among which are 'Anthem Dulcimer' (1890); 'Liber Musicus' (1851); 'Millions Glee-book' (1853); 'Cultivation of the Voice without a Master'; 'Self-Instructor in Musical Composition and Thorough Bass'; 'Singing-School and Music-Teachers Companion'; 'Melodeon and Seraphine Instructor Book'; etc.

Woodbury, Levi, American jurist: b. Francetown, N. H., 22 Dec. 1789; d. Portsmouth, N. H., 7 Sept. 1851. He was graduated at Dartmouth in 1809, studied law, was admitted to the bar in 1812, and practised his profession at Francetown till 1816, when he was elected clerk of the State senate. In 1817 he was appointed a judge of the superior court, and in 1823 he was elected governor of New Hampshire, and in 1825 represented Portsmouth in the State legislature and became speaker of the House. He sat in the United States Senate 1825-31, and on the expiration of his term was elected in March 1831 to the State Senate, but declined the offer in order to accept that of secretary of the navy, to which he had been appointed by President Jackson. In July 1834 he was transferred to the office of secretary of the treasury, which he retained during the remainder of President Jackson's second term of office, and the whole of President Van Buren's administration, retiring on the inauguration of President Harrison 4 March 1841. During this period the post of chief justice of the superior court of New Hampshire was offered him, but was declined. In 1841 he was again returned to the United States Senate, but resigned in 1845 on account of his appointment as

WOODBURY—WOODCOCK

a justice of the Supreme Court, an office which he held till his death. He was a highly influential member of the Democratic party and at the time of his death was considered its most likely presidential candidate.

Woodbury, N. J., city, county-seat of Gloucester County; on the Delaware River, and on the West Jersey & Sea Shore (Pennsylvania) Railroad; eight miles south of Philadelphia. The chief industrial establishments are glass factory, chemical works, piano factory, and machine shops. Woodbury ships large quantities of fruit and vegetables. In 1900 (government census) the city had 81 manufacturing establishments capitalized for \$1,129,715. The value of the finished products, each year, was \$988,612. There are six churches, a high school, public and private schools, and a public library. The three banks have a combined capital of \$300,000. In 1903 the combined deposits amounted to \$1,243,000. Pop. (1890) 3,911; (1900) 4,087; (1910) 4,642.

Woodburytype Printing, a process for obtaining by means of photography a picture or illustration for press printing. This process was invented in 1901 by W. B. Woodbury, and is the only photo-mechanical one which, in the printing press, realizes the gradations of tone without grain or texture of any kind. The idea of the process emanated from the carbon print, in which the picture is formed in all its gradations by various thicknesses of pigmented gelatine, the shadows, representing the greatest thickness, being in relatively high relief, and the high lights the lowest. Mr. Woodbury conceived the idea of making an electrotype mold of a carbon picture, and using the mold so obtained as a printing surface by covering it over with warm pigmented gelatine, and by flat pressure attaching a sheet of paper to the pigment, so that when the gelatine jelly was set he could detach it from its mold and thus by repeating the operation obtain unlimited copies. This was practically the Woodburytype; but of course there were difficulties and imperfections, which the inventor quickly set to work to overcome. He found that a thick film of gelatine and bichromate, when exposed under a negative and washed, gave a very high, sharp relief; and he also found that when this relief was perfectly dry it possessed the property of being absolutely incompressible, in other words, it was as hard as steel, and could be used as a die. The relief film of gelatine was placed on a block of smooth, hardened steel, with raised edges, upon this was laid a sheet of type metal or lead about a quarter of an inch thick, and the arrangement was then placed under a hydraulic press capable of exerting a pressure of about 40 hundredweight to the square inch. The pressure forced the lead into the gelatine image with such accuracy that every shade and detail of the relief was impressed. The raised edges round the steel block prevented the metal from squeezing out, and on being detached, a mold in lead was obtained which could be used as a printing surface for thousands of copies. The seemingly delicate relief in gelatine was quite uninjured by this treatment, and would serve for any number of further pressed molds.

The printing press for these pictures is special, but quite simple. It is formed of a cast-iron base, on which is fitted a movable table

to hold the mold, which is bedded down on to it with gutta percha; over the table is a hinged lid, faced with plate-glass, with a lever attachment for giving the pressure. The printing ink is a solution of gelatine in a hot state to which a pigment is added to give any desired tint. In printing the lead mold is first oiled to prevent the gelatine sticking, and a pool of the warm ink is poured on to the middle of the mold; over this pool is laid a sheet of paper water-proofed with shellac, and the lid of the press is brought down over the whole, and pressure applied. The pressure squeezes out over the edges of the mold all superfluous ink, and all that is left is that retained in the graduated hollows and depressions of the lead mold; the warm ink sets in a few minutes, and on opening the press the paper support is removed with its gelatine copy of the molded picture firmly attached to it.

Woodcock, any of several birds, particularly certain snipe-like birds of the family *Scolopacidae*. The American woodcock, duck snipe, bog-sucker, big-headed snipe, mud snipe, etc., as this bird is variously named by gunners, is the *Philohela minor* of ornithologists. The body is full and robust, the wings short and rounded; the head and eyes very large, and the bill straight, tapering from the stout base, grooved for nearly the entire length and exceedingly sensitive at the end; there is practically no gape; the ear is situated beneath the eye; the legs are very short for a snipe, and the tibiae are fully feathered. The woodcock is 10 or 12 inches long and weighs from 7 to 9 ounces, the females being the larger. The colors are a soft harmonious blending of various shades of brown and gray, with black mottling above, nearly uniform pale brown below. Except that it invades Ontario and other southern provinces of Canada the woodcock seldom ventures beyond the limits of the eastern half of the United States at any season. In winter it migrates to the South Atlantic and Gulf States, but most of them breed in the central and northern States. Migration northward begins very early and many of the more hardy individuals reach the Middle and New England States in early March before the frost has left the ground. At such times, and also in the late fall, they secure their food, consisting of insects and their larvae, snails, etc., by turning over fallen leaves, but during the summer and whenever the ground is sufficiently soft they probe it with their long sensitive bills and with great skill extract the earthworms which constitute their chief food, and of which enormous quantities are consumed. They frequent bogs and swampy places along alder-grown streams, hillside springs, etc., during the summer; but in the autumn forsake these coverts for cornfields and the undergrowth of low woods, the surest indication of their presence being their perforations in the soft earth. Few birds are more uncertain in the choice of their feeding grounds, changing from high to low as the weather varies from wet to dry. Their solitary habits are no doubt the result of the character of their favorite food, to obtain which they not infrequently search city lawns after nightfall. As the large size of the eye suggests, the woodcock is crepuscular and nocturnal, the period of its greatest activity being in the hours immediately succeeding sunset and

WOODCHUCK—WOODEN WALL

preceding dawn, though, especially when moonlight, it may be abroad throughout the night. During the day it remains hidden in deep bogs and thickets, rising only when forced and then springing perpendicularly above the bushes it flies in an irregular course for a short distance and drops as suddenly to the ground and its concealment.

Mating takes place as soon as the sexes meet in the spring and is followed in April or even earlier by the building of a simple nest of leaves and grass in a dry and well concealed spot in a bog. Four or sometimes five buff or clay-colored eggs variously spotted with dark brown and lilac are laid, and after three weeks of incubation yield the fluffy, brownish-white young, which at once leave the nest led by the old birds to the feeding grounds. The love antics and nuptial flights of the male are curious and interesting. In the former he is a diminutive of a turkey cock; in the latter he mounts in the darkness of night on swift wing high in the air above a wet meadow, then falls like a shot with a whistling sound as the air rushes through his tail and wing-quills. He has also a simple whistling vocal note. The female especially is very solicitous in the care of her young and not only feigns injury in order to entice an intruder from their vicinity, but frequently has been observed to bear them one by one between her thighs to a place of safety. Later in the summer the members of a family scatter to feed singly in their home-bog and with the advance of fall seek the uplands as above described. With the coming of hard frosts most of the woodcock leave for the South and become concentrated in favorite bottoms along the lower Mississippi and other sections of the Gulf States. There and at this time the outrageous practice of fire-hunting is indulged in, chiefly by negroes and market hunters. One person bears a torch which lights the ground and confuses the birds which are often killed in great numbers by a second person with gun or club as they crouch confused on the ground. It is to this practice, as well as to the equally to be condemned spring and early summer shooting still permitted in some of the northern States, that the almost threatened extinction of this fine bird in many parts of the country is to be largely traced. Among natural enemies of the woodcock are minks, hawks, owls, red squirrels, cats, and snakes.

Next to the quail the woodcock is probably the most popular game bird of the eastern United States, and deservedly so, but its numbers have greatly decreased since about 1880. To save it all gunners should unite in abolishing spring and summer shooting and in restricting the great destruction which takes place in the Gulf States during the winter by the absolute prohibition of fire-hunting and similar barbarous methods. In every respect fall hunting is the most delightful sport, and the birds are then in the best condition for the table. Most gunners prefer a cocker or other spaniel for flushing the birds from thick coverts and much the same style of gun and ammunition as quail shooting requires. The successful woodcock shooter must be a quick and steady shot, for these birds are as changeable as the Wilson's snipe in their moods, and their coverts offer greater difficulties. When shooting in cornfields the gunner sometimes stands on an

elevated platform so that he can overlook the stalks among which his dogs are quartering.

The European woodcock, which occasionally occurs in this country, is a much larger bird and belongs to the genus *Scolopax*, which has long pointed wings, in which the outer primaries are neither much shortened nor attenuated. Its color is a brown of various shades, of darkest hue on the back, while the tail is black above, tipped with gray. Their habits are very similar to those of the American kind.

Consult: Lewis, 'American Sportsman' (Philadelphia 1868); Fisher, 'Yearbook,' United States Department of Agriculture for 1901.

Woodchuck, or Ground-hog, an American marmot (*Arctomys monas*), 18 to 24 inches long, grizzled above, and chestnut red below, the feet and tail blackish. It is found from Hudson Bay to South Carolina, and west to the neighborhood of the Rocky Mountains, several distinct sub-species and varieties appearing in this wide range. It digs deep holes in the fields, on sides of hills, or under rocks in the woods, in a slanting direction, at first upward to keep out the water, with several compartments, and usually with more than one entrance. It passes the winter in the burrow, in a dormant state. The digging is effected by the powerful fore feet, assisted by the teeth, the dirt being thrown backward under the belly and then kicked out by the widespread hind feet. The food consists of various plants, fruits, and vegetables; they are especially fond of red clover, often doing great mischief to this crop, and to gardens; another favorite food is celery.

Woodchucks feed chiefly during the early morning and late afternoon and spend most of the remaining time lying in the sun or sleeping in the nests at the bottom of their burrows. They become extremely fat and retire to hibernate on the first intimation of approaching winter and only appear after the snow is gone in the spring. A large brood of young is born in the spring or early summer and when a few months old they are forced to leave the burrow and to shift for themselves. The woodchuck is generally a bold and unsuspecting creature, but has alert senses and where much persecuted may become vigilant. When driven to bay it may fight with considerable courage and effectiveness. Its chief natural enemies are foxes and skunks, but the animal remains generally abundant in both cultivated regions and woodlands in the New England and Middle States. Consult Ingersoll, 'Wild Neighbors' (New York 1898).

Wooden Wall, the side of a ship; hence the ship itself. When Athens was in imminent danger from the Persians 483 a.c., during the invasion of Xerxes, the oracle at Delphi was consulted, and, intimating that the city and country were doomed to ruin, added that—when all was lost, a wooden wall should still shelter her citizens. The Athenian young men interpreted "a wooden wall" to signify ships; Themistocles, who had probably influenced the oracle to utter the prediction or counsel it had given, was of the same opinion; faith was put in the navy, and the result was the great victory of Salamis. It was from this incident that the expression, "The wooden walls of England," arose.

WOODFALL—WOODMEN FRATERNAL BENEFICIARY ORDERS

Woodfall, Henry Sampson, English printer and journalist: b. London 21 June 1739; d. there 12 Dec. 1805. From about 1758 until 1793, when he disposed of his interest and retired, he conducted the 'Public Advertiser,' among the contributors to which was Sir Philip Francis (q.v.). He printed the 'Letters of Junius' (see JUNIUS), which have been conjecturally assigned to Francis. Woodfall, however, is on record as stating that he definitely knew Francis "never wrote a line of Junius." After the Junius letter to the king had appeared in the 'Advertiser,' Woodfall was prosecuted for libel by the crown, but the verdict rendered was practically one of acquittal. In 1797 Woodfall was master of the Stationers' Company. The 'Advertiser' ceased to exist in 1795.

Woodford, Steward Lyndon, American diplomat: b. New York 3 Sept. 1835. He was graduated from Columbia in 1854 and admitted to the bar three years later, beginning practice in his native city in 1857. He served in the Federal army 1862-5, being at one period military commandant of Charleston and Savannah, and becoming brevet brigadier-general of volunteers. He was lieutenant-governor of New York 1866-8, but in 1870 as the Republican candidate for governor was defeated. A member of Congress 1873-5, and attorney for the southern district of New York 1877-83, he subsequently engaged in private practice, but was appointed minister to Spain in 1897, returning to the United States the next year on the opening of the Spanish-American War.

Woodhull, Alfred Alexander, American brigadier-general: b. Princeton, N. J., 13 Apr. 1837. He was graduated from Princeton, from which he received the degree of LL.D. also, and from the University of Pennsylvania as M.D. He served through the Civil War in various medical and surgical offices, and in March 1865 he was breveted captain, major and lieutenant-colonel "for faithful and meritorious services." He has since filled many other offices in the surgical department of the army, and by Act of 23 Apr. 1904 he was advanced to the rank of brigadier-general, retired. He lectured on personal hygiene and general sanitation at Princeton 1902-7, and has been the author of several medical works, especially 'Military Hygiene' (1890, 1898, 1904, 1909), and 'Personal Hygiene' (1906).

Woodhull, John Francis, American university professor: b. Westport, N. Y., 2 July 1857. He was graduated from Yale, studied at Johns Hopkins and received Ph.D. from Columbia. He was teacher and principal in secondary schools 1881-5; professor of natural sciences at the New York State Normal School, 1887; professor physical sciences, Teachers College, Columbia 1888—; member of the University Council of Columbia 1899-1902. He is a lecturer and author; some of his books being 'Physics' (1900); 'Simple Experiments in Chemistry' (1905); 'Physical Nature Study Library' (1906); 'Electricity and Its Everyday Uses' (1911).

Woodland, Cal., city, county-seat of Yolo County; on the Southern Pacific railroad; about 85 miles northeast of San Francisco, and 20 miles north of Sacramento. It is in an agricultural region, in which wheat and grapes are

among the chief products. Many sheep are raised in Yolo County. The chief industries are connected with raising and shipping grapes, manufacturing wine, and shipping wheat, fruit, barley, wool, and live stock. The educational institutions are Holy Rosary Academy (R. C.), Hesperian College (Disciples of Christ), opened in 1861, a high school established in 1895, graded elementary public and parish schools. The city has several banks with deposits amounting to about \$2,000,000. Pop. (1910) 3,187.

Woodland Area of the United States. Our forests now cover 550,000,000 acres, or about one-fourth of the United States. Forests publicly owned contain one-fifth of all timber standing. Forests privately owned contain at least four-fifths of the standing timber. The timber privately owned is not only four times that publicly owned, but it is generally more valuable. Forestry is now practised on 70 per cent of the forests publicly owned and on less than 1 per cent of the forests privately owned, or on only 18 per cent of the total area of forests. The original forests of the United States contained timber in quantity and variety far beyond that upon any other area of similar size in the world. They covered 850,000,000 acres, with a stand of not less than 5,200,000,000,000 board feet of merchantable timber, according to present standards of use. There were five great forest regions—the northern, the southern, the central, the Rocky Mountain and the Pacific. The present rate of cutting is three times the annual growth of the forests of the United States. The great pineries of the lake States are nearing exhaustion and great inroads have been made upon the supply of valuable timber throughout all parts of the country. The heavy demands for timber have been rapidly pushing the great centres of lumber industry toward the south and west. In 1900 the production of yellow pine lumber amounted to sixteen and one-quarter billion feet; the Douglas fir of the northwest held second place, with over four and three-quarters billion feet; while oak came third, with four and one-half billion feet. We take from our forests yearly, including waste in logging and in manufacture, 20,000,000,000 cubic feet of wood, valued at about \$1,250,000,000.

Woodmen Fraternal Beneficiary Orders. The Modern Woodmen of America is the largest and the Woodmen of the World is the second largest life insurance fraternity in the United States. The Modern Woodmen of America was originated at Lyons, Iowa, November 1882; the Woodmen of the World at Omaha, Neb., June 1890, by Joseph Cullen Root, who promulgated and promoted both Orders, serving as president of the Modern Woodmen of America until November 1890, and as president of the Woodmen of the World from its inception, being unanimously elected by both Orders, and his present term of office extending until June 1914.

Both Orders are secret beneficiary Orders, affording life insurance to the members thereof, the Modern Woodmen of America being what is known as a "current rate Order," and the Woodmen of the World, with higher monthly rates, has accumulated an Emergency Fund and surplus aggregating about \$15,000,000, on the first of January 1912. This Emergency Fund

WOODPECKER

is available when twelve monthly contributions from its members during any year are less than the mortuary losses incurred. In addition to the payment of death benefits, the maximum being \$3,000, a monument is erected to the memory of every deceased member at a cost of \$100, and on attaining 70 years of age, providing the member is totally, physically disabled by reason of old age, he receives one-tenth of the amount of the certificate or policy held each year until same is fully paid. Should he die in the interim, the unpaid balance goes to his designated devisee.

The Modern Woodmen pay to the designated beneficiary on the death of its members the amount designated in the certificate or policy held, the maximum being \$3,000. It has a membership of about 1,250,000.

The Woodmen of the World, Sovereign Jurisdiction, which includes all of the United States except the seven states on the Pacific coast, has a membership of about 600,000, 1 January 1912. Auxiliary Orders which have sprung from the Woodmen of the World and have coordinate fraternal relations therewith, are the Pacific Jurisdiction Woodmen of the World, having a membership of about 105,000, and the Canadian Order Woodmen of the World, having a membership of about 20,000. The Woodmen Circle and the Women of Woodcraft and the Companions of the Forest are also "off-shoots" of the Order and are composed principally of women, having an aggregate membership of about 160,000. Other Orders, known as the Columbian Woodmen and Southern Woodmen, which have no coordinate relations, have sprung from the Woodmen of the World.

The Royal Neighbors is the recognized women's auxiliary of the Modern Woodmen of America and has a membership of about 200,000.

The Modern Woodmen of America has paid about \$95,000,000 death losses. The Woodmen of the World has paid about \$65,000,000 in death losses, and has erected over 45,000 monuments to the memory of its deceased members since organization to the first of January 1912.

Joseph Cullen Root is the author of the rituals and ritualistic ceremonies of both parent Orders of Woodcraft, the first being based upon the ancient Roman forms of adoption of children and conferring of citizenship upon naturalized people, and the second on the three periods of life and the lesson taught in the biblical history of Joseph and his brethren.

The Modern Woodmen have recently established a sanatorium for treatment of tuberculosis, and the Woodmen of the World a home for their aged, decrepit and indigent members, and a sanatorium in the State of Texas for the treatment of tuberculosis.

The Orders of Woodcraft have been the most progressive of the life insurance fraternities.

The Sovereign Camp Woodmen of the World in 1912 erected an 18-story office building in Omaha, Neb., costing \$1,500,000, ground space 110 x 132 ft., the institution occupying the greater portion of the building for headquarters.

Woodpecker, a bird of the family *Picidae*, one of the most sharply defined families of birds which, with the related *Picumnidae* and *Tyrannidae* form the very natural order *Pici*. These birds have a unique type of bony palate

(saurognathous) especially characterized by the separation of the vomer into a pair of splint-bones, the fourth toe is reversed permanently so that it forms a pair with the hallux, which, however, is occasionally absent, and there are numerous other anatomical peculiarities. In addition the *Picidae* are distinguished by the acute, rigid and bristly character of the tips of the five well-developed pairs of tail-quills, the outer or sixth pair being rudimentary. In typical woodpeckers the head is large, the neck slender but very powerful, the bill stout, straight, chisel-pointed, and often strengthened by longitudinal ridges, the nostrils protected by a thick screen of bristly feathers, and the feet very powerful, with short stout tarsi, strongly hooked claws and rough scales. The tongue is remarkably well developed, being slender and flexible, with a barbed horny tip in most cases, and the horns extended upward over the head into the orbit or even penetrating into the upper mandible; and suitably provided with muscles for projecting it far beyond the tip of the bill. This arrangement is of the greatest value in enabling these birds to explore deep recesses for insects, and even to drag larvae from their burrows by means of the barbed tip and the adhesive secretion which the tongue receives from the greatly developed salivary glands.

The woodpeckers are a large group, 45 genera and 350 species having been enumerated in 1890. Except Australia, Madagascar, and certain groups of the Polynesian Islands they inhabit the forest-clad regions of the entire globe. By reason of their peculiar mode of life the great majority of species are confined to woodland districts, and they range from the seashore to the mountain heights. Although chiefly insectivorous, the peculiar source of their food, which consists to a great extent of the long-lived wood-boring larvae, makes them largely independent of seasons, and being hardy birds they are, with some exceptions, little migratory and are equally at home in far northern and tropical forests. However, possibly in correlation with the more numerous and larger wood-borers of the warm regions, they there reach the largest size and greatest numerical development. A few woodpeckers, like *Colaptes* (see *FLICKER*), robin-like, search for worms and insects on the ground, and these have weaker, slightly curved rounded bills, and smaller heads. Some as *Sphyrapicus* and its allies, drill the outer bark of rosaceous trees and lap the flowing sap with their bristle-brushed tongues or, like the red-head woodpecker, peck the ripest apples, green corn, and other sweet and succulent vegetables. But the great majority are strictly insectivorous and perform an invaluable service to human kind by their enormous destruction of a class of destructive insects which is largely beyond artificial attack. With the possible exception of the yellow-bellied woodpecker (*Sphyrapicus varius*), which may be considered doubtful, every species of woodpecker inhabiting the eastern United States is decidedly beneficial. In searching for insects woodpeckers usually begin at the very base of a tree trunk, move spirally upward supported by their strong feet and bracket-like tail, peering into every crevice, pausing occasionally to tap the bark and remain in an attitude of apparent intense listening, and move on. From time to time they peck the

WOODPECKER

work with hammer-like blows delivered with intense energy, which make the chips fly rapidly and soon expose the larva whose presence within had apparently been detected by the bird's keen sense of hearing. As soon as one tree is sufficiently explored they go to another, but often spend a long time searching and drilling in a decayed limb or stump much infested with insects. Woodpeckers have a very characteristic undulating or galloping flight which is seldom much protracted. Their nests are in holes drilled by themselves first horizontally then vertically downward and chambered in the usually partially decayed limb or bole of a tree or some suitable substitute. The eggs are always white with a highly polished porcelain-like surface, are usually numerous, and are deposited on a few wood chips at the bottom of the excavation. Woodpeckers are unmusical, their nuptial song being a loud harsh rattling cry or laugh, combined with a loud drumming on resonant branches. Except during the nesting season they are usually silent and solitary birds.

About one half of the known woodpeckers are American and 8 genera and 30 species and sub-species enter the United States, a number of racial forms being confined to the extreme Southwest. As their habits conform pretty closely to the account just given, only a few representative forms need be mentioned. The primate and crowning glory of our species is the magnificent ivory-billed woodpecker (*Campylorhynchus principalis*), the embodiment of all the highest attributes of woodpecker life and structure. (See IVORY-BILL.) A smaller, duller colored, but generally close counterpart of the ivory-bill is the pileated woodpecker (*Geopelia pileatus*), of similar habits and only less quickly affected by the destructive agencies of man. Its original range, however, was much wider, but it is now a generally very rare and wary inhabitant of the deep woods. It is about 17 inches long, the bill is black and the fourth toe is peculiar in being much shorter than the hallux. *Dryobates* includes numerous species of small and moderate size with the plumage variously striped and spotted with black and white, the males with a red head-patch which the females lack. Very familiar nearly resident species of the wood lot and orchard are the little downy and the larger hairy woodpeckers (*D. pubescens* and *D. villosus*). A more southern and woodland species is *D. borealis*, the red-cockaded woodpecker, while the West has *D. scalaris*, *D. nuttalli*, and *D. arizonae*. *Xenopus* contains the noteworthy *X. albolarvatus* which has a completely white head, while *Picoides* is still more noteworthy in the entire absence of the hallux. Two or three species of the three-toed woodpeckers (*P. arcticus*, *P. americanus*, etc.) inhabit the northern parts and western mountains of North America, and others occur in Eurasia. Besides the much divided black and white the plumage shows some yellow and brown. The remaining North American species are less typical in structure and habits. First of them is the handsome and well-known red-headed woodpecker (*Melanerpes erythrocephalus*), locally a common bird among old timber everywhere east of the Rocky Mountains, except in New England. Southward it is resident, northward migratory, and more a vegetarian than most woodpeckers, eating, besides insects, which it sometimes catches flying, nuts, berries,

green corn, and fruits, in search of which it haunts the orchard. The California woodpecker (*M. formicivorus*), as its name indicates, finds ants a favorite article of diet, but also eats fruits, nuts, and acorns, and has a remarkable habit of storing vast quantities of the latter in chinks and holes, often completely studding the boles of tall trees with acorns wedged in singly and sometimes using the space behind the cornices of houses for storage. Much speculation has been indulged in concerning this habit, but the fact is that these birds are migratory and but few of the acorns or the contained grubs thus stored are ever utilized for food. The eastern red-head stores up acorns less regularly. This genus also includes three other western species and the red-bellied woodpecker (*M. carolinus*) chiefly of the southeastern United States.

The sap-sucking habit and the peculiar structure of the tongue of *Sphyrapicus* have been alluded to above. The eastern species, the yellow-bellied woodpecker (*S. varius*), is the well-known sap-sucker (q.v.), whose rows of holes completely encircling the trunks of orchard trees are so familiar. This bird is a migrant, breeding only in the northern States and Canada. The plumage is much variegated with black and white, brown, yellow, and red, and is remarkable for its variability with sex, age, and season. In the West are *S. nuchalis*, *S. ruber*, and *S. thyroideus*. Finally, the genus *Colaptes* contains the handsome ground-woodpeckers or flickers (q.v.), which, while retaining much that is picine in structure and habit, in other respects depart widely. They subsist largely on berries, are more or less migratory and in addition to the ordinary woodpecker calls have many others, some of which are clear and musical. Their headquarters are in the southwestern United States and Mexico, where four species occur including the red-shafted flicker (*C. cafer*), and the gilded flicker (*C. chrysoides*). The eastern or yellow-shafted flicker (*Gaurax*) is one of the best known birds whose ubiquity and marked individuality are attested by the great variety of local names which it has received. In the middle Mississippi Valley and westward, where their ranges overlap, numerous examples combining the characters of *C. auratus* and *C. cafer* in every degree and supposed to be hybrids are found.

The Old World woodpeckers for the most part belong to the typical groups of genera, but three-toed woodpeckers are found in Europe and Asia and in the Malayan Islands, the latter being a peculiar crested genus (*Geopopocordes*). A ground woodpecker (*Geocolaptes olivaceus*) of South Africa is gregarious and remarkable from its habit of nesting, kingfisher-like, in holes in banks. The related wrynecks (*Ilygiidae*), confined to the Old World, have the general aspects of larks, with soft broadly webbed tail feathers, but their feet and other anatomical parts and their habits, as well, are those of the woodpeckers. However, they nest in natural holes in trees or banks and often seek their food on the ground. The *Picumnidae* have short tails with feathers of the ordinary structure. They are mostly diminutive insectivorous birds, chiefly confined to tropical America.

Consult: Hargitt, 'Catalogue Birds British Museum,' Vol. XVIII. (London 1890); Malherbe, 'Monographie des Picidées' (Mots

WOODROW -- WOODSTOCK

1862); Baird, Brewer and Ridgway, 'Land Birds of North America,' Vol. II. (Boston 1874); Coues, 'Key to North American Birds' (Boston 1903); Beal, 'Food of Woodpeckers.'

Woodrow, wud'rô, James, American Presbyterian clergyman and college president: b. Carlisle, England, 30 May 1808; d. Columbia, S. C., 17 Jan. 1907. He was graduated from Jefferson College, Canonsburg, Pa., in 1849, subsequently studied at the Lawrence Scientific School at Harvard, and at the University of Heidelberg. He was professor of natural science in Oglethorpe College, Ga., 1853-61, entered the Presbyterian ministry in 1860 and was Perkins professor in the Presbyterian Theological Seminary, Columbia, S. C., 1861-84. From 1891 to 1897 he was president of South Carolina College.

Woodruff, Willford, American Mormon leader: b. Northington (now Avon), Conn., 1 March 1807; d. Salt Lake City, Utah, 3 Sept. 1898. He adopted the Mormon faith in 1833 and in subsequent years made missionary tours to England, and in the eastern States. He was one of the Mormon emigrants to Salt Lake City; became one of the 12 apostles in 1839; and in 1887 was elected president of the Mormon Church. For 23 years he held a seat in the Utah Legislature.

Woods, Leonard, American Congregational clergyman: b. Princeton, Mass., 19 June 1774; d. Andover, Mass., 24 Aug. 1854. Graduated from Harvard in 1796, he studied theology at Somers, Conn., as a pupil of Dr. Charles Backus, in 1798 was ordained pastor of the church at Newbury, Mass., and upon the establishment of the Andover Theological Seminary in 1808 was made professor of Christian theology there. In 1846 he retired from the active duties of the chair. He was a strict Calvinist, well-versed in metaphysical studies, a clear and vigorous writer, and a champion of the New England theology against Ware, Buckminster, Channing, and other Unitarians. "He is emphatically," says H. P. Smith, "the 'judicious' divine of the later New England theology." He was prominent in the founding of the Temperance Society, the American Tract Society; and the Board of Commissioners of foreign missions. Among his works are: 'Letters to Unitarians' (1820); 'Lectures on the Inspiration of the Scriptures' (1829); 'Memoirs of American Missionaries' (1833); 'Examination of the Doctrine of Perfection' (1841); and 'Lectures on Church Government' (1843).

Woods, William Burnham, American jurist: b. Newark, Ohio, 3 Aug. 1824; d. Washington, D. C., 14 May 1887. He was graduated at Yale in 1845, was admitted to the Ohio bar in 1847 and mayor of his native city 1856-7. In the last named year he was elected to the Ohio legislature and chosen speaker, at the outbreak of the Civil War entered the Union army as lieutenant-colonel of the 76th Ohio regiment; and was promoted brevet major-general. At the close of the war he took up his residence in Alabama, was chosen chancellor of that State in 1868, appointed circuit judge of the 5th District in 1870, and in 1880 became an associate justice of the United States Supreme Court.

Wood's Holl, or Wood's Hole, Mass., in the town of Falmouth (q.v.), in Barnstable

County; on Buzzards Bay, and on the New York, New Haven & Hartford railroad. It has a large, deep harbor, and is widely known as the location of a station with a marine laboratory of the United States Fish Commission.

Woodstock, Canada, city and port of entry, county-seat of Oxford County, Ontario, on the River Thames and Cedar Creek, and on the Grand Trunk and Canadian Pacific railways; 49 miles southwest of Hamilton, 29 miles northeast of London. It has a large trade in grain, produce, and manufactured articles. The industries include manufactures of foundry and machine-shop products, bicycles, organs and pianos, wire mattresses, furniture, carriages, woollens, flour, etc. Woodstock is the seat of Woodstock College (Baptist), and has banks and daily and weekly newspapers; lighted by electricity, has good water and sewerage systems. Pop. about 10,000.

Woodstock, Conn., town in Windham County; about 40 miles northeast of Hartford and five miles northwest of Putnam. It contains six villages. The town is in an agricultural and stock-raising region. The chief industrial establishments are creameries and cotton twine factories. It has Woodstock Academy, graded schools, and a public library. Woodstock belonged to Massachusetts when it was incorporated in 1690. In 1749 it was annexed to Connecticut. Pop. (1910) 1,849.

Woodstock, Ill., city, county-seat of McHenry County; on the Chicago & Northwestern railroad; about 50 miles northwest of Chicago and 30 miles east of Rockford. It is in an agricultural and dairying section. It has flour and lumber mills, creamery, pickle, and canning works. The principal public buildings are the county court-house, city-hall, and business blocks. It has six churches, Todd Seminary for boys, a high school, established in 1867, public elementary schools, and a public library. The three banks have a capital of \$85,000, and the deposits amount to approximately \$650,000. Pop. (1910) 4,331.

Woodstock, Vt., town, county-seat of Windsor County; on the Ottaguechee River, and on the Woodstock railroad; 38 miles south of Montpelier. It is in an agricultural and dairying region, and contains four villages. The chief industrial establishments are butter and cheese factories, sash, door, and blind factories, flour and lumber mills. Other manufactures are hay-rakes, sleighs, wagons, carriages, butter tubs, and cheese boxes. The town has six churches, graded grammar and elementary schools, and the Norman Williams Public Library, founded in 1885. There are two banks; the national bank has a capital of \$150,000. In 1903 the savings bank had deposits amounting to \$1,215,650. Pop. (1910) 2,545.

Woodstock, Va., town, county-seat of Shenandoah County; on the north branch of the Shenandoah River, and on the Baltimore & Ohio railroad; about 95 miles west of Washington, D. C., and 155 miles northwest of Richmond. It was founded in 1762. It is in an agricultural and stock-raising region, and its industries are connected chiefly with farm and dairy products and the marketing of live-stock. It has eight churches, and graded schools for both races. There are (1903) one national bank, one private

bank, and one loan and trust company. Pop. 1,200.

Woodstock, a novel by Sir Walter Scott, published in 1826. It is an English tale of the time of Cromwell; the events occurring in the year 1652, immediately after the battle of Worcester. The scene is laid chiefly in the Royal Park and Manor of Woodstock.

Woodward, Calvin Milton, American educator. b. Fitchburg, Mass., 25 Aug. 1837. He was graduated at Harvard University in 1860; was principal of Brown High School, Newburyport, Mass., 1860-5. During one year of the Civil War he was captain Co. A, 48th Massachusetts Volunteers, serving in Louisiana. In 1865 he was called to the Washington University, Saint Louis; elected professor of mathematics and applied sciences 1870; dean of School of Engineering 1871-96, and founder and director of the Saint Louis Manual Training School since its organization in 1879. Dr. Woodward's service to the cause of education has been marked by great devotion and by equally great success, especially along practical lines. He served as a member of the Saint Louis School Board 1877-9 and again since 1897; regent Missouri State University 1891-7; fellow and vice-president of the American Association for the Advancement of Science 1903 and 1904; president of the Society for the Promotion of Engineering Education; member of the Saint Louis Academy of Science; past president Saint Louis Engineers' Club; was re-elected dean of the School of Engineering and Architecture July 1901. He is well known as a lecturer on Manual Training. Received the degree of Doctor of Philosophy from Washington University in 1883. He has contributed many valuable articles to educational and scientific journals (see article SAINT LOUIS in this encyclopedia) and has written: 'History of the Saint Louis Bridge' (1881); 'The Manual Training-School' (1887); 'Manual Training in Education' (1890); etc.

Woodward, Robert Simpson, American astronomer, physicist and mathematician: b. 21 July 1849 at Rochester, Mich. He was graduated with the degree of C.E. at University of Michigan 1872 and was appointed assistant engineer United States Lake Survey. During 1882-4 he served as assistant astronomer to the United States Transit of Venus Commission; from 1884-90 he was astronomer, geographer and chief geographer to the United States Geological Survey, became assistant in the United States Coast and Geodetic Survey in 1890, and served for three years. From 1893-1905 he was professor of mechanics and mathematical physics at Columbia University and from 1895 to 1905 was dean of the faculty of pure science. In 1905 he became president of Carnegie Institution, Washington, D. C.

Dr. Woodward was president of the American Mathematical Society 1898-1900, American Association for the Advancement of Science 1900-1, New York Academy of Sciences 1900-2. In 1892 he received the degree of doctor of philosophy from the University of Michigan, and in 1904 the degree of doctor of laws from the University of Wisconsin. Dr. Woodward has published many papers and addresses on astronomy, geodesy, mathematics and other scientific subjects. (See article EARTH in this encyclopedia.) He has written 'Smithsonian

Geographical Tables' (1894); 'Higher Mathematics—a Text Book for Classical and Engineering Colleges' (1896 with Mansfield Merriam); etc.

Woodworth, wüd'wérth, Samuel, American author and editor: b. Scituate, Mass., 13 Jan. 1785; d. New York 9 Dec. 1842. He received a limited education in his native town, and was apprenticed in Boston to Benjamin Russell, editor and publisher of the 'Columbian Centinel.' After the expiration of his indentures he published for a brief period at New Haven, Conn., the weekly 'Belles-Lettres Repository,' engaged in other literary pursuits, in which he continued with more or less success until the close of his life. He was one of the founders in 1823, in conjunction with George P. Morris, of the 'New York Mirror,' from which he withdrew within a year. Among his writings were a number of dramatic pieces, and 'Champions of Freedom' (1816), but his reputation rests principally upon his songs and miscellaneous poems, one of which, 'The Old Oaken Bucket,' obtained a wide popularity. His collected poems were published, with a memoir by G. P. Morris, in 1861.

Woof. See WEAVING.

Wool, wål, John Ellis, American general: b. Newburgh, N. Y., 20 Feb. 1789; d. Troy, N. Y., 10 Nov. 1869. He was in early life proprietor of a bookstore in Troy, and his property being consumed by fire, he turned to the law, but his studies were interrupted by the war with Great Britain in 1812, when he became captain in the 13th infantry. He distinguished himself at Queenstown Heights, Plattsburg, and Beekmantown, and in 1816 was appointed inspector-general of the northern division; in 1818 lieutenant-colonel; in 1821 inspector-general of the whole army; and in 1826 brevet brigadier-general for 10 years' faithful service. In 1832 the government sent him to Europe to examine the military systems of some of the principal nations. In 1836 he was charged with removing the Cherokee Indians to Arkansas; and in 1838, during the Canadian difficulties, made a reconnaissance through the wilds of northern Maine, with a view to the defense of the frontier. He was appointed brigadier-general, 25 June 1841, and at the commencement of the Mexican War was ordered to the West to organize the volunteers, 30 May 1846, and in less than six weeks despatched to the seat of war 12,000 troops fully armed and equipped. He selected the ground on which was fought the battle of Buena Vista 23 Feb. 1847, commanded in the early part of the action, and for his conduct on this occasion was brevetted a major-general in 1848. After his return home in July 1848, he commanded the eastern military division, with headquarters at Troy, until October 1853, when he was placed at the head of the department of the East, with his headquarters at Baltimore. From 1854 to 1857 he was in command of the department of the Pacific and of the Eastern department again 1857-60. When civil war was imminent toward the close of 1860, he offered his services to the government, and after the attack upon Fort Sumter went to New York to organize, equip, and send to Washington the first regiments of volunteers. In August he was sent to Fortress Monroe as commander of the department of Virginia, and from that post led an expedition

CALVIN MILTON WOODWARD.

WOOL-GRASS — WOOLF

which occupied Norfolk, 10 May 1862. He was promoted to be full major-general in the regular army, 16 May 1862 and the next year was placed on the retired list.

Wool-grass, a rush. See **SCIAPUS**.

Wool, Manufacture of. Among the ancients wool was the staple material for clothing and was used before either flax or cotton. The ancient Greeks manufactured wool into goods of special excellence. The making of woollen cloth was introduced into England by the Romans. In the 18th century Yorkshire became the great wool centre of Great Britain.

Modern Process.—In making woollen cloth the essential processes, as carried on in modern factories, are: (1) the stapling of the raw wool. In this process the stapler or sorter works at a table covered with wire netting, through which the dirt falls while the various qualities of wool are being separated. The wool is then ready to be put through the (2) scouring machine, where it passes on an endless apron into an oblong vat, which contains a steaming soapy solution. Here it is carried forward gently by means of rakes until it is thoroughly soaked and cleansed. After this it is taken to the (3) drying framework of wire netting, under which are situated steam-heated pipes. A fan-blast drives the heated air upwards through the wet wool, which lies on the wire netting, until it is all equally

form of yarn, is now fit for (8) weaving into woollen cloth. (See **WEAVING**.) When it is taken out of the loom the cloth is washed, to free it from oil and other impurities, and also beaten while it lies in the water by wooden hammers moved by machinery, while it is again dyed if found necessary. After it has been scoured in water mixed with fuller's earth, the cloth undergoes a process of (9) teasing and shearing (see **TRASSI**), in which the pile or nap is first raised, and then cut to the proper length by machines. When this is done it is (10) steamed and pressed between polished iron plates in a hydraulic press.

Worsted.—In the manufacture of worsted yarn the long-staple wool fibres are brought as far as possible into a parallel condition by processes called gilling and combing. The wool, in a damp condition, is passed through a series of "gill boxes," in which steel gills or combs separate and straighten the fibres until, from the last box, it issues in a long sliver. In this condition it is run through a delicate combing machine. From the combing machine it is delivered in the condition of a fine sliver technically called top, and after being further attenuated by a process of roving the thread is spun into yarn on what is called a throstle-frame.

Statistics.—The United States census reports of wool manufacture, by decades, from 1880 to 1910, show the following:

	1880	1890	1900	1910
Number of factories.....	2,330	1,693	1,414	913
Capital.....	\$143,512,778	\$245,866,743	\$320,179,749	\$418,465,000
Value of product.....	\$38,035,686	\$70,587,511	\$96,990,484	\$19,826,000

dried. When necessary this is the point in the process when it is "dyed in the wool." It is then ready for the (4) willeying or teasing machine, which consists of a revolving drum furnished with hooked teeth, close above which are set cylinders with hooked teeth moving in a contrary direction. The wool is fed in upon the drum, which whirls with great speed; and between the two sets of teeth working in opposite directions it is disentangled, torn, and cast out in fine, free fibres. With some classes of wool it is also necessary, at this stage, to remove soda and burrs by steeping them in a solution of sulphuric acid, or passing them through a burring machine, by which the burrs are extracted. The wool is now dry and brittle; and before submitting it to the process (5) of carding, it is sprinkled with oil and well beaten with staves in order to give it suppleness. This process of carding is accomplished by a series of three delicate and complex machines called a scribbler, an intermediate, and a finisher. These machines have various intricate cylinders and rollers, studded with teeth and working in opposite directions, over which the wool is passed until it is torn, interblended, and finally delivered from the finisher in a continuous flat lap. It is then cut into strips and passed (6) to the condensing machine, which rubs the strip into a soft, loose cord or sliver technically called a "slubbing." The wool is now ready for (7) spinning into yarn, and this is accomplished in a wool-spinning mule, which draws and twists the sliver into the required thinness, the process being essentially the same as in cotton-spinning. The wool, which has thus been brought into the

In total value of products Massachusetts led in 1900, with a product valued at \$81,041,537; Pennsylvania was second with \$71,878,503. No other State approached these two. Rhode Island was third in rank, with a product somewhat less than half that of Massachusetts, followed by New York, with a product not quite half that of Pennsylvania. New Jersey, Maine, and Connecticut were very close together, with but little over \$1,000,000 difference in the value of their products. New Hampshire was eighth, with products of \$7,624,062. Vermont had \$2,572,046, and Tennessee \$1,517,194. These 10 States were the producers of nearly 70 per cent of the total wool manufactured in the United States. The total amount paid in wages in 1900 was \$57,933,817, divided as follows: To men, \$36,412,872; to women, \$19,549,423; to children, \$1,971,522. In 1890 the total amount was \$54,339,775, of which \$33,702,231 was paid to men, \$18,883,174 to women, and \$1,754,370 to children.

Wool-sorters' Disease. See **ANTHRAX**.

Woolens Bill, in American history, a tariff bill introduced into Congress in 1816. It provided for the general reduction of tariff on woollen and cotton goods. The bill was supported by Clay, Calhoun, and Lowndes, and opposed by Daniel Webster and John Randolph. The bill passed the House by a vote of 88 to 54 and the Senate by 25 to 7. It became a law 27 April 1816. See **TARIFF**; **UNITED STATES — TARIFF IN THE**.

Woolf, wulf, Albert Edward, American chemist and inventor, son of Edward Woolf (q.v.). He was educated in the College of the

City of New York. Among his discoveries are the antiseptic and medical properties of sea-water combined with the electric current; the use of peroxide of hydrogen to bleach black ostrich feathers white, and also its employment as an antiseptic.

Woolf, Benjamin Edward, son of Edward Woolf (q.v.), American dramatist and musician: b. London 16 Feb. 1836; d. Boston, Mass., 7 Feb. 1901. Coming to New York in childhood with his parents, he early displayed a passion for music and was carefully trained by his father, with such results that in later days he became the leader of orchestras in Boston, Philadelphia, and New Orleans. He settled in Boston, where he was dramatic critic for the 'Saturday Evening Gazette' 1871-93, a post which he quitted for a similar one on the Boston Herald. He was an industrial musical composer, writing many overtures, quintets, and trios, besides plays and operettas. His most successful comedy was 'The Mighty Dollar,' while his operetta, 'The Doctor of Alcantara,' was a favorite in its time.

Woolf, Edward, American musician: b. London, England, September 1803; d. New York 14 March 1882. In 1839 he came to New York, where his musical genius was soon recognized not only as teacher and composer, but also as orchestral leader. His excessive shyness and modesty kept him in the background and prevented his securing the position intellectually his due. He was the author of many novels that appeared in the early years of 'The Jewish Messenger,' such as 'The Jewess of Toledo'; 'The Vicomte D'Arblay'; and 'Judith of Bohemia.'

Woolf, Michael Angelo, American artist, son of Edward Woolf (q.v.): b. London, England, 1837; d. New York 4 March 1899. Brought to New York in his babyhood, he early evinced a love for art and studied wood engraving for seven years. In the early sixties he was an illustrator for 'Yankee Notions,' then a popular journal, and was on the stage for a time, returning finally to art, and going to Munich and Paris to study painting. On resuming his work in New York, his first drawing of a ragged newsboy for a paper called 'The Pick' elicited such comment that he began the series of street caricatures on which rests his fame. These reveal his humanity as well as artistic insight.

Woolf, Philip, American physician and novelist, son of Edward Woolf (q.v.): b. New York 7 Feb. 1848; d. 1903. He was graduated from the Medical College of Bellevue Hospital in 1868, and was for some time editor of the Boston 'Saturday Evening Gazette.' His novels include: 'Who is Guilty?' 'The Trail of the Serpent'; 'Satan's Mirror'; 'Three Women and a Dead Man'; 'Goldenrod and Aster.'

Woollett, wul'et, William, English engraver: b. Maidstone, Kent, 1735; d. London 23 May 1785. His family originally came from Holland, and he was instructed in his art by an engraver named John Tinney. He engraved historical subjects and portraits, but was most successful in landscapes, in which he exhibited such varied excellences as, in the opinion of Longhi, to entitle him to be considered 'the marvel and the example for all contemporary engravers and for those of the present time.'

His foregrounds are vigorous and solid, and his aerial perspective wonderfully clear and true, while he treats water, the crux of the engraver, with supreme success. His masterpieces are his 'Niobe' and other plates after pictures by Richard Wilson, and the 'Death of Wolfe' and the 'Battle of La Hogue' after West. He was the first who conceived and embodied in practice the idea of uniting in one plate the three methods of engraving, by aqua fortis, the burin, and the dry needle. His genuine plates are estimated at 123, but impressions are exceedingly rare and valuable, as he permitted no imperfect prints to be struck off. Consult Fagan, 'Catalogue Raisonné of the Engraved Works of William Woollett' (1885).

Woolley, wul'ei, Celia Parker, American Unitarian minister: b. Toledo, Ohio, 14 June 1848. Graduated from Coldwater Female Seminary, in 1868 she was married to J. H. Woolley, and in 1876 removed to Chicago. She was pastor of the Unitarian Church, Geneva, Ill., for three years, and of the Independent Liberal Church, Chicago (1896-8), since when she has been active as a lecturer and in the work of women's clubs. She is the author of the novels 'Love and Theology' (1887), republished as 'Rachel Armstrong, or, Love and Theology'; 'A Girl Graduate' (1889); 'Roger Hunt' (1893); 'The Western Slope' (1903).

Woolley, John Granville, American prohibitionist: b. Collinsville, Ohio, 15 Feb. 1850. Graduated from the Ohio Wesleyan Seminary in 1871, he was admitted to the bar of the Illinois supreme court in 1873, became city attorney of Paris, Ill., in 1875, and prosecuting attorney in Minneapolis in 1881. At one period addicted to intemperance, he began lecturing against it in 1888, and has lectured to many audiences on this theme at home and abroad. He has been editor of 'The New Voice,' a prohibition organ, since 1899, and was the Presidential candidate for the Prohibition party in 1900, receiving a vote of 208,914. He has published: 'Seed'; 'The Sower'; 'Civilization by Faith'; 'The Christian Citizen'; 'The Lion Hunter.'

Woolman, John, American Quaker preacher: b. Northampton, Burlington County, N. J., August 1720; d. York, England, 7 Oct. 1772. In 1741 he became a speaker in the meetings of the Society of Friends. He was at this time a bookkeeper in a mercantile house, but subsequently learned the tailor's trade. In 1746, in company with Isaac Andrews, he made his first itinerant tour in some of the back settlements of Virginia, and from that time continued at intervals to visit the societies of Friends in the different portions of the colonies. In 1763 he visited the Indians on the Susquehanna. He both spoke and wrote much against slavery. His best-known work is the posthumous 'Journal of John Woolman's Life and Travels in the Service of the Gospel' (1775), which Whittier edited, with an introduction, in 1871. Woolman's simple and candid style has been highly praised by Charles Lamb, Crabb Robinson, and others. Among his other writings are: 'Some Considerations on the Keeping of Negroes' (1753; Part II., 1762); 'Considerations' on various topics (1768); and 'Serious Considerations' (1773). In 1774-5 a collective edition of his works appeared. Consult Whittier's sketch in the above-mentioned edition of the 'Journal.'

Woolner, Thomas, English sculptor and poet: b. Hadleigh, Suffolk, 17 Dec. 1825; d. London 7 Oct. 1892. At 12 he was placed in the studio of William Behnes, in 1842 entered the schools of the Royal Academy, and in the following year his first work, 'Eleanor Sucking the Poison from the Arm of Prince Edward,' was exhibited. His first work to attract attention was 'The Death of Boadicea' (1844), and this success was followed by 'Alastor' (1846); 'Puck' (1847); 'Titania and Her Indian Boy' (1848); and 'Eros and Euphrosyne' (1848). About 1850 he was associated with Rossetti and the other artists who formed the 'Pre-Raphaelite Brotherhood,' in founding the short-lived but famous periodical called 'The Germ.' His contributions, which were in verse, were collected and published, with additions, under the name 'My Beautiful Lady' (1863). Woolner visited Australia in 1852, and one of his first works on his return was a life-size statue of Lord Bacon for the Oxford Museum. Among his more important works are: 'Elaine with the Shield of Sir Lancelot'; 'In Memoriam' (1870); 'Guinevere' (1872); 'Lady Godiva' (1876); portrait busts of Carlyle, Tennyson, Darwin, Newman, Gladstone, Kingsley, and Dickens, and statues of Lord Macaulay for Trinity College, Cambridge (1866), Sir Bartle Frere for Bombay (1872), Dr. Whewell for Trinity College, Cambridge (1873), Lord Lawrence for Calcutta (1875), J. S. Mill for the Thames Embankment (1878), Captain Cook for Sydney (1879), Sir Stamford Raffles for Singapore (1887), and Lord Palmerston for Palace Yard, Westminster. He became a Royal Academician in 1874, and for a time was professor of sculpture in the Academy. His fame as a sculptor has overshadowed his reputation as a poet, but 'Pygmalion' (1881), 'Silenus' (1884), 'Tiresias' (1886), and 'Poems' (1887) give him honorable rank among the minor poets of his time. Consult Garnett, in 'Dictionary of National Biography.'

Woolsey, wul'sal, Sarah Chauncey ('**Susan Coolidge**'), American author, niece of T. D. Woolsey (q.v.): b. Cleveland, Ohio, 1845; d. Newport, R. I., 9 April 1905. As 'Susan Coolidge' she was a popular writer for children, but also wrote for their elders 'Verses' (1880); 'A Short History of Philadelphia' (1887). Among her books for young people were: 'The New Year's Bargain' (1871); 'What Katy Did' (1872); 'A Guernsey Lily' (1881); 'A Little Country Girl' (1885). She also edited 'The Diary and Letters of Mrs. Deane' (1878); 'The Diary and Letters of Frances Burney, Madame D'Arbly' (1880).

Woolsey, Theodore Dwight, American college president and scholar: b. New York 31 Oct. 1801; d. New Haven, Conn., 1 July 1889. He was graduated at Yale College in 1820; studied law in Philadelphia and theology at Princeton, was tutor at Yale 1823-5, and was licensed to preach in 1825. After studying abroad (1827-30) he was professor of Greek at Yale 1831-46, and president of the college 1846-71. In 1871-81 he was chairman of the American company of revisers of the New Testament. Besides editions of Greek plays—the 'Alcestis' of Euripides (1833), the 'Antigone' (1835), and 'Electra' (1837) of Sophocles, the 'Prometheus' of Plato (1837), as well as the 'Gor-

gias' of Plato (1842)—his works include an 'Introduction to the Study of International Law' (1860, 5th ed., 1879); 'Essays on Divorce and Divorce Legislation' (1869); 'Political Science; or the State Theoretically and Practically Considered' (1877); 'Religion of the Past and of the Future' (1871); 'Communism and Socialism' (1880). He also edited Lieber's 'Civil Liberty and Self-Government' (1871) and his 'Manual of Political Ethics' (1871). He was one of the founders of the 'New Englander,' to which he often contributed, one of the regents of the Smithsonian Institution, and at one period president of the American Oriental Association.

Woolsey, Theodore Salisbury, American professor of international law, son of T. D. Woolsey (q.v.): b. New Haven, Conn., 22 Oct. 1852. He was graduated from Yale in 1872, became instructor in international law at Yale in 1877, and since 1878 has been full professor there. He has published 'America's Foreign Policy' (1872); and edited Pomeroy's 'International Law' (1886); and the 6th edition of Woolsey's 'International Law' (1891). He was also associate editor of Johnson's 'Universal Cyclopedia' (1892-5).

Woolson, wul'son, Abba Louisa Gould, American lecturer and author: b. Windham, Maine, 30 April 1838. She has lectured extensively on literary, social, historical, and dramatic subjects, and was the founder and honorary president of the Castilian Club of Boston. She has published 'Women in American Society' (1873); 'Browsing among Books' (1881); 'George Eliot and Her Heroines' (1886); 'Dress Reform' (1874).

Woolson, Constance Fenimore, American author: b. Claremont, N. H., 5 March 1848; d. Venice, Italy, 24 Jan. 1894. Educated in Cleveland, Ohio, and New York, she resided in Ohio, then in Florida and other Southern States, and finally abroad, chiefly in Italy. Her first story published in a secular magazine—contributions to Episcopalian periodicals had preceded it—was 'The Happy Valley' in 'Harper's Monthly' (1870). In this much of her subsequent work appeared. Many poems were printed from time to time, but these were never collected. Her reputation was based on works in fiction, the volumes being 'The Old Stone House' (1873); 'Castle Nowhere: Lake Country Sketches' (1875); 'Rodman the Keeper' (1880); 'Anne' (1882); 'For the Major' (1883); 'East Angels' (1886); 'Jupiter Lights' (1889); 'Horace Chase' (1894); and 'The Front Yard, and Other Italian Stories' (1895). Their background is generally American, preferably the Lake region or the South; and when it shifts to Europe is less skilfully treated. They were highly praised by Stedman and other critics for equal freedom in presenting diverse types and conformity to high literary standards.

Woolston, wul'ston, Thomas, English deist: b. Northampton 1669; d. London 31 Jan. 1731. He was educated at Sidney Sussex College, Cambridge, became a fellow, and took orders in the English Church. He made a careful study of Origen and in 1705 published the 'Old Apology for the Truth of the Christian Religion against the Jews and Gentiles Revived.' He maintained in this work that Moses was an allegorical personage, and his history typical

WOOLWICH — WOOSTER

of that of Christ. In 1721 he published 'The Moderator between the Infidel and the Apostate,' dialogues tending to show that the Gospel miracles by themselves could not prove Christ to be the Messiah. This work occasioned great scandal, and it was only through the intervention of Whiston that the author escaped a prosecution. In 1721 his college deprived him of his fellowship. The views set forth in his last work Woolston developed more fully in 'The Moderator between an Infidel and an Apostate' (1725). His famous series of six 'Discourses on the Miracles of Christ' appeared 1727-9, with two 'Defences' in 1729 and 1730. He was indicted for blasphemy in consequence of the publication of this work and was imprisoned. His collected works with 'Life' appeared in five volumes (1833).

Woolwich, wŭl'ch, England, a former town of Kent, now a metropolitan borough of London, on the right bank of the Thames, eight miles below London Bridge. It has many ancient, together with a number of handsome modern houses, an old church (restored 1894), other places of worship, a town-hall, and several charitable endowments. It owes its importance to the royal arsenal, which occupies an area of above 350 acres, and is one of the most complete and magnificent establishments of the kind in the world, with extensive forges, foundries, and workshops of various kinds in which the newest types of machinery are employed for the manufacture of immense quantities of warlike stores which are kept in suitable magazines and store-houses. In the Rotunda there is a fine historical collection of arms and other interesting objects. A large garrison is stationed at Woolwich, which is the headquarters of the royal artillery; and there are various barracks, a military and a naval hospital, etc. On the edge of Woolwich Common, a fine large open area, are the handsome buildings of the Royal Military Academy (see MILITARY SCHOOLS); and the Royal Ordnance College is also at Woolwich. At North Woolwich, on the opposite side of the river, to which runs a free steam ferry, many houses and extensive factories, especially of telegraph cables, have recently sprung up. Pop. of metropolitan borough about 130,000.

Woonsocket, wŭn-sŭk'ŕt, R. I., city in Providence County; on the Blackstone River, and on the New York, New Haven & Hartford (two branches) railroad; about 15 miles northwest of Providence and 37 miles southwest of Boston. It has electric lines extending to all the near-by towns. The river here is spanned by a bridge which cost originally \$300,000. It has three parks and the county fair grounds. It is a well-known manufacturing city. In 1909 (government census) there were 130 manufacturing establishments, capitalized for \$27,700,000, and in which were 11,245 wage-earners, to whom were paid annually \$5,676,000. The total cost of raw material used annually was \$16,762,000 and the value of the finished products was \$68,219,000. The chief manufactures were cotton goods, foundry and machine-shop products, worsted goods, and hosiery and knit goods, each of which had an annual output valued at more than \$1,000,000. Other manufactures are carved and turned wood, wagons, carriages, woolen goods, machinery, and furniture.

The educational institutions are a high school,

established in 1857; Sacred Heart College (R. C.), for young men; Saint Ann's Academy (R. C.) for girls and young women, public and parish schools, the Harris Institute Library containing about 16,000 volumes. There are nine banks and trust companies. In 1903 the Woonsocket Institute for Savings had deposits amounting to \$4,800,000; and the Producers Saving Bank had \$1,415,570. The city owns and operates the water-works.

Woonsocket is a consolidation of several factory villages. The first village called Woonsocket is not included in the limits of the present city. The city was set off in 1867 from the town of Cumberland; in 1871 a part of Smithfield was annexed, and 13 June 1888 the city was incorporated. Pop. (1890) 20,830; (1900) 28,204; (1910) 38,125. Consult Richardson, 'History of Woonsocket.'

Woorari, or Woorara. See CURARI.

Wooster, wŭs'tŕ, David, American Revolutionary general: b. Stratford, Conn., 2 March 1710; d. Danbury, Conn., 2 May 1777. He was graduated at Yale College in 1738; and in 1739, when the war broke out between England and Spain, entered the provincial army as lieutenant, and was subsequently made captain of a vessel built and equipped by the colony for the defense of its coasts. In 1745 he participated in the expedition against Louisburg, and went in command of a cartel ship to England, where he was made a captain in the regular service under Sir William Pepperell. In the French war which ended in 1763 he was commissioned by the governor of Connecticut as colonel, and subsequently as brigadier-general, and served during the whole war. In April 1775 he was one of the members of the assembly of Connecticut who concerted the plan for the seizure of Ticonderoga; and when the continental army was organized he was appointed one of the eight brigadier-generals. He was engaged in the expedition into Canada, where after the death of Gen. Montgomery he for a time held the chief command. He resigned and returned to Connecticut, and was major-general of the militia when Tryon invaded that province for the purpose of destroying the military stores at Danbury. He attacked Tryon's rear guard 27 April 1777, and while rallying his men was mortally wounded. On 17 June Congress voted that a monument should be erected to his memory, but no steps were taken to have the resolution carried into effect, and his neglected grave was not identified until 1854, on 27 April of which year the corner-stone of a monument to his memory was laid, by act of the legislature of Connecticut. The town of Wooster, Ohio, was named in his honor.

Wooster, Ohio, city, county-seat of Wayne County; on the Killbuck Creek, and on the Pennsylvania and the Baltimore & Ohio R.R.'s; about 30 miles southwest of Cleveland. It is in an agricultural and stock-raising region. It has manufactories of flour, furniture, doors, sash, and blinds, boilers, engines, mill-gearing, and brick. There are two national banks having a combined capital of \$200,000, and one private bank. The educational institutions are Wooster University, the Ohio Agricultural Experiment Station, a high school, public elementary schools, and two libraries. Pop. (1890) 5,001; (1900) 6,063; (1910) 6,136.

Worcester, Walter, Dean Conant, American educator: b. Thetford, Vt., 1 Oct. 1866. He was graduated at the University of Michigan in 1889, having previously accompanied the Steere scientific expedition to the Philippine Islands in 1887-9. He was instructor in animal morphology at the University of Michigan 1893-6, becoming assistant professor in the last-named year. In 1890-2 he again traveled in the Philippines, with F. S. Bourns, in a tour known as 'The Menage Scientific Expedition,' and in January 1899 was appointed one of the United States commissioners to the islands to investigate and report on conditions there. He has published: 'Preliminary Notes on Birds and Mammals collected by the Menage Scientific Expedition to the Philippine Islands' (1894); 'Contributions to Philippine Ornithology' (1898); 'The Philippine Islands and their People' (1898).

Worcester, Edward Somerset, 2d Marquis of, English inventor: b. Raglan Castle, Monmouthshire, 1601; d. 3 April 1667. He engaged in the service of Charles I. during the civil war, and was employed by the king to act for him in Ireland; but when his errand was discovered he was treated with duplicity by Charles, and retired to France in 1648. Returning to England in 1652 he was imprisoned in the Tower 1652-4, and his estates were sequestered, but after the Restoration he recovered most of these. He afterward spent his time in retirement, and in the cultivation of natural philosophy and mechanics. In 1663 he published a book entitled 'Century of the Names and Scantlings of Inventions as I can call to mind to have been Tried and Perfected,' in which he first gave a description of the uses and effects of an engine for 'driving up water by fire'; and afterward published a small pamphlet, called 'An Exact and True Definition of the most Stupendous Water-commanding Engine, invented by the Marquis of Worcester.' In neither of these does he give any statement of the mode of constructing his engine; but, from his description and account of its effects, it may be inferred that its action depended on the condensation as well as the elastic force of the steam. (See *STEAM-ENGINE*.) Consult Dirck, 'Life, Times, and Scientific Labors of the Second Marquis of Worcester' (1865); Dirck, 'Worcesteriana' (1865).

Worcester, Edwin Dean, American railway official: b. Albany, N. Y., 19 Nov. 1828; d. New York 13 June 1904. He studied law, and followed various pursuits, but entered railroad-ing in 1853, when he became a member of the accounting department of the New York Central railway. He laid out, opened, and managed the books of this company when there were no precedents in the United States for the organization of large railways, and the present accounting system of railways in this country is largely the development of his work. Subsequently he became successively treasurer and secretary of the company; in 1873 secretary and treasurer of the Lake Shore & Michigan Southern, in 1883 its vice-president; and in 1878 secretary of the Michigan Central, in 1883 its vice-president. From 1883 he was also secretary, or treasurer, or both, in 15 other companies.

Worcester, Joseph Emerson, American lexicographer: b. Bedford, N. H., 24 Aug. 1784;

d. Cambridge, Mass., 27 Oct. 1865. He was graduated from Yale in 1811, and from 1819 resided in Cambridge, Mass., busily preparing and publishing books. Among his earlier works, compiled with much accuracy and excellent condensation, were: 'A Geographical Dictionary' (1817), of which an enlarged edition appeared in 1843; a 'Gazetteer of the United States' (1818); and 'Outlines of Scripture Geography' (1828). His first effort in English lexicography was an edition of 'Johnson's English Dictionary, as Improved by Todd and Abridged by Chambers, with Walker's Pronouncing Dictionary Combined' (1828). In 1829 he prepared an abridgment of Webster's 'American Dictionary'; and in 1830 published his 'Comprehensive Pronouncing and Explanatory Dictionary.' After collecting philological works in Europe in 1830-1, he edited the 'American Almanac' in 1831-43, and in 1846 published the 'Universal and Critical Dictionary of the English Language.' His chief work, 'A Dictionary of the English Language,' appeared in 1860, being the first work of the sort to employ illustrations. For this many collaborators were employed, particularly for the definition of technical terms. The chief point of difference between the work of Webster and that of Worcester was that the latter sought to present the language as it was, while Webster endeavored to exhibit it improved as he thought it should be. Essentially the same scheme, that of Worcester, is now observed by each. By many Worcester has been preferred to Webster for its pronunciations.

Worcester, Noah, American theologian: b. Hollis, N. H., 25 Nov. 1758; d. Brighton, Mass., 31 Oct. 1837. He was a fifer in the Continental army in 1775, and entered the service again for a short time as file-major in 1777. In 1786 he was licensed to preach by a Congregational association, and in 1787 ordained pastor of the church in Thornton, N. H., where he had held local offices and been elected representative to the General Court. In 1802 he was employed as the first missionary of the New Hampshire Missionary Society, and in that capacity traveled and preached widely in the northern portion of the State. In 1810 he removed to Salisbury, and took charge of the congregation, and in 1813 settled at Brighton, Mass. His work on the doctrine of the Trinity, entitled 'Bible News of the Father, Son, and Holy Ghost' (1810), soon became the subject of severe animadversion, the Hopkinton association, of which he was a member, passing a formal sentence of condemnation against the book. From 1813 to 1818 he edited 'The Christian Disciple,' a periodical published in Boston, and in 1814 published his tract, 'A Solemn Review of the Custom of War,' once well known, and translated into several languages. Shortly after this the Massachusetts peace society was formed, and in 1819 he commenced 'The Friend of Peace,' which continued in quarterly numbers for 10 years, nearly the whole of it being written by himself. In 1829 he published 'The Atoning Sacrifice a Display of Love, not of Wrath,' in 1831, 'The Causes and Evils of Contention among Christians'; and in 1833, 'Last Thoughts on Important Subjects.' Among his further writings is a 'Respectful Address to the Trinitarian Clergy' (1812). Consult the 'Memoirs' by Ware (1844).

WORCESTER

Worcester, England, (1) A city, the capital of Worcestershire, situated in a beautiful vale on the eastern bank of the Severn, 103 miles north-northwest of London. The cathedral is a noble specimen of Gothic simplicity. It was first erected by Ethelred, king of Mercia, in 680, and a later edifice was burned down and rebuilt in the beginning of the 13th century. It was restored in 1857-74. It is 394 feet long, 78 feet wide, and 68 feet high, and the tower, which rises from the intersection of the nave and aisles to the altitude of 170 feet, is ornamented at the corners by lofty pinnacles. It contains many handsome monuments and sculptures. There are about 20 other handsome places of worship, such as Holy Trinity, Saint Nicholas, Saint Andrews, Saint Helena, etc. Among other buildings are the shire-hall, guildhall, Victoria Institute (library, museum, etc.), corn-exchange, the hop and fruit market, museum of natural history, two grammar-schools, several charitable institutions, etc. Worcester is the chief seat of the English leather glove trade, has celebrated porcelain-works, "Worcester sauce" works, vinegar-works, chemical and manure works, foundries, railway signal works, carriage factories, and other works. Its trade in hops is extensive. There are municipal electric lighting works, and a service of electric trams. The most remarkable event here was the victory of the English army, under Cromwell, over the Scotch in the cause of Charles II., in 1651. Pop. about 50,000. (2) An inland county bounded on the north by Salop and Stafford, on the west by Hereford, on the south by Gloucester, and on the east by Warwick; with some separated portions, enclosed by the counties of Gloucester and Warwick. The area is 739.7 square miles. The surface, generally level or gently undulating, has some extensive and beautiful vales, the principal of which, that of the Severn, is 30 miles long, and one quarter to a mile broad. On the southwest are the fine Malvern Hills, the loftiest of which is 1,444 feet above sea-level. The soil, composed chiefly of clay and loam, is of great fertility. The principal crops are wheat, barley, oats, beans, pease, turnips, and hops. The orchards are celebrated for their apples and cider. The vales consist of meadows and rich pastures. The sheep are of the Leicester breed. Coal is found in the north and northwest; the brine springs at Droitwich and Stoke Prior supply immense quantities of salt; iron is found with the coal, and the manufacture of iron and steel, and of hardware, is extensive; carpets and rugs are made at Kidderminster; and porcelain, gloves, and other articles at Worcester. Pop. about 362,000.

Worcester, Mass., city, one of the county-seats of Worcester County; on the Blackstone River, and on the New York, N. H. & H., the Boston & M., and the New York Central R.R.'s; 44 miles west of Boston and 45 miles northwest of Providence. Electric railways extend to all the near-by towns and to Boston. The city was begun in a valley, but it now occupies a number of the surrounding hills; the average elevation above sea-level is 500 feet.

Industries.—Worcester is noted for the number and variety of its manufacturing establishments. In 1909 (government census) the city had 580 manufactures, capitalized for \$64,639,000, and employing 31,404 officials, clerks and

wage-earners to whom were paid annually \$19,464,000, an increase of nearly \$5,000,000 in 10 years. The raw material used each year cost \$42,601,000, and the value of the finished products was \$77,148,000. The 90 foundries and machine-shops in 1900 had an output valued at \$8,492,686. The 11 boot and shoe factories had productions valued at \$1,610,605; the products of the 5 envelope establishments amounted to \$1,150,802; the 11 wirework factories, including wire rope and cable, produced annually goods to the amount of \$1,531,047; and the 11 woolen goods mills had an annual output valued at \$1,553,297. There were 34 additional industries, each one of which had finished products amounting annually to over \$100,000. Some of these industries are the manufacturing of worsted goods, machinery, printing and publishing products, musical instruments, marble and stone products, lumber products, leather goods, women's clothing (factory products), men's clothing (factory products), and food products.

Buildings and Municipal Improvements.—The principal public buildings are the government building, court-house, city-hall, State armory, Mechanics' Hall, the Young Men's Christian Association and the Young Women's Christian Association buildings, buildings of the Women's Clubs, the State Mutual Assurance Company, several charitable institutions, the religious and educational institutions, and the Union Station. The area is 32 square miles, including the hill country and the lakes within the city limits. There are 10 public parks, having a combined area of 400 acres; Lake Park has 110 acres and Elm Park 86 acres. The system of waterworks cost, originally, \$3,670,000; there are about 200 miles of mains. The sewer system covers about 170 miles, and cost \$5,341,534. The city is divided into eight wards, which diverge from the centre of the city like the spokes of a wheel. The principal business streets run north and south.

Churches, Charitable, and Educational Institutions.—There are over 100 church organizations, having about 85 edifices. The denominations rank, according to the number of their buildings, as follows: Congregationalist, 18; Baptist, 16; Methodist Episcopal, 12; Roman Catholic, 12; Protestant Episcopal, 5; Unitarian, 4, and others 1 or 2 each. The hospitals are the Washburn Memorial Hospital, for women and children; the City Hospital, Homoeopathic Hospital, Saint Vincent's and Saint Francis' hospitals. Other institutions are the State Insane Asylum, the State Odd Fellows' Home, Saint Ann's Orphan Asylum, Saint Vincent's Home for the Aged, Saint Francis' Home for the Aged, Our Lady of Mercy orphanage, a home for the friendless, and a number of private hospitals. The educational institutions are Clark University, a post-graduate school for original research, opened in 1889; College of the Holy Cross (R. C.), opened in 1843; the Bancroft School; Highland Military Academy (P. E.); Kimball's School for Girls; Saint John's School (R. C.); Worcester Academy; Becker's Business College; Worcester Polytechnic Institute; Hinman's Business College; a State normal school; three public high schools; the classical opened in 1845, the English high school, and the evening high school, public and parish elementary schools, the Free Public Library containing about 140,000 volumes, two anti-tubercular

societies, historical and literary societies, and several school libraries.

Banks and Finances.—In 1903 Worcester had 16 banks. The exchanges at the United States clearing-house for the year ending 30 Sept. 1901 amounted to \$74,397,774. The deposits (1903) were in five banks over \$1,000,000 and less than \$2,000,000; in two banks over \$2,000,000 and less than \$3,000,000; in three banks over \$7,000,000 and less than \$10,000,000, and in one bank \$17,396,260. The municipal expenditures for maintenance and operation are about \$3,300,000. The chief items of expense are as follows: schools, \$552,300; streets, \$536,000; fire department, \$194,500; police department, \$153,500; charity department, \$79,000; public library, \$51,000.

Government.—The government is vested in a mayor, whose term of office is one year; a board of councilmen, 24 members, three from each ward; and a board of aldermen, nine members elected at large. The two boards constitute the city council, who have power to accept or reject the mayor's appointments. The council elects the heads of the departments.

History.—A settlement was made here in 1673-4, called Quansagumog Plantations. The Indians were hostile to the settlers from the first; but at the beginning of King Philip's war, their hostility increased and the whites abandoned the settlement. Another attempt to found a settlement was made in 1684, but after a few years the Indians forced the whites to again leave. The second time the place was named Worcester on account of Worcester in England having been the home of some of the settlers. In 1713 the permanent settlement was made. In 1722 Worcester was incorporated; and chartered as a city in 1848. Isaac Thomas, a publisher, moved from Boston to Worcester in 1775, and until about 1800 the town was among the leading publishing places in the country.

Population.—The city ranks second in the State in population. Since 1850 it has grown rapidly. Beginning with 1800 the Federal census returns have given the following: (1800) 2,411; (1820) 2,962; (1850) 17,049; (1870) 41,405; (1880) 58,291; (1890) 84,655; (1900) 118,421; (1910 census) 145,086. Consult: Rice, 'Worcester in 1898'; Hurd, 'History of Worcester County.'

Worcester, South Africa, a town of Cape Colony, 60 miles northeast of Cape Town, 109 miles by rail through Paarl and Tulbagh. The town is regularly laid out, the streets being planted with trees. It is well supplied with water from the Hex River. The vine is extensively cultivated in the neighborhood, and brandy and wine are made in considerable quantity. ^{Pop.} 6,000.

Worcester College, Oxford, England, originally called Gloucester Hall, was founded in 1714 by Sir Thomas Cookes of Bentley, Worcestershire, for a provost, six fellows, and six scholars. Under the statutes of 1882 Worcester College consists of a provost, 9 or 10 fellows, and 19 scholars. There are a number of exhibitions, two of which are connected with the Charterhouse School, and three with Bromsgrove School.

Worcester Polytechnic Institute, a technical school located at Worcester, Mass. It was

founded by a gift of \$100,000 from John Boynton of Tempieton; was chartered in 1865, and opened to students in 1868. Since that time its resources have been largely increased both by private benefactions and State donations. Though one of the earliest schools of the kind in the United States, it has in every way kept pace with the progress in scientific and technical education, and is recognized as one of the leading American technical schools. From the time of its organization, laboratory and shop work has been a distinctive feature of its work; it was one of the first schools to emphasize the importance of laboratory methods, and the first in the United States to establish a workshop as an essential part of the training in mechanical engineering. The Institute offers five courses of four years each leading to the degree of B.S.; these are mechanical, civil, and electrical engineering, chemistry and general science. English, political science, French or German, and mathematics are included in all courses; the work of the Freshman year is practically the same for all courses; with the Sophomore year the special work of each course begins. The work of the junior and senior years of the general science course is largely elective; otherwise the courses are practically all required. Graduate courses are provided leading to the degrees of M.S., D.S., M.E., C.E., and E.E. The students maintain a Christian Association, chapters of several Greek letter fraternities, and an Athletic Association. The institute publishes a bi-monthly 'Journal,' containing original articles on technical and scientific subjects by the alumni and faculty, and news of the institute and general scientific progress. The institute campus comprises 12 acres on a slight elevation in the northwestern part of the city; it slopes on the north to Institute Park. The buildings on this campus are Boynton Hall, the Washburn Shops (machine and forge), the Salisbury Laboratories (chemistry, physics, and electrical engineering), the engineering laboratories (mechanical engineering), the power laboratory, the foundry, and the high potentials laboratory; the institute also owns Newton Hall, a dormitory a short distance from the campus, and a hydraulics laboratory at Chaffins, five miles distant. The laboratories and shops are all excellently equipped; the library in 1904 contained 9,100 volumes besides departmental libraries; the Worcester Free Public Library, and the library of the American Antiquarian Society are also open to students. Free tuition is given to 40 Massachusetts students in consideration of which the institute receives an annual State appropriation. The students in 1910 numbered 524; the total number of graduates was 1,420.

Worde, wórd, Wynkyn de, English printer and stationer: b. Alsace late 15th century; d. London about 1534. His name was properly Jan van Wynkyn, de Worde being a place-name referring to Worth in Alsace. He probably went to England with Caxton from Bruges in 1476, and later was an apprentice in Caxton's printing-office, in which he established himself in 1491. He printed between 700 and 800 works, which are known through fragments or at least one complete copy. This is thought to be not more than half his work. Among the books printed by him were Higden's 'Polychronicon' (1495), in which occurs the first specimen of music-type;

Wakefield's 'Oratio' (1524), in which Italic type was first used in England; and Trevisa's rendering of Bartholomaeus Anglicus' 'De Proprietatibus Rerum' (1406).

Worden, wór'dn, John Lorkner, American naval officer: b. Ossining, Westchester County, N. Y., 12 March 1818; d. Washington, D. C., 18 Oct. 1897. He was appointed a midshipman in the navy in 1834. At the beginning of the Civil War he was captured by the Confederates but after seven months was exchanged and was subsequently ordered to the command of the Monitor, which left New York 6 March 1862. He arrived at Hampden Roads on the evening of the 8th, after the iron-clad Merrimac had destroyed the wooden frigates Cumberland and Congress. On the morning of the 9th a memorable battle was fought by the Merrimac and Monitor, the former of which was partly disabled and abandoned the fight, after several violent collisions with the Monitor. Promoted commander in 1862 and captain in 1863, he commanded the iron-clad Montauk in the operations against Fort Sumter in April of that year. In June 1868 he was promoted commodore, and in 1873 rear-admiral. He was superintendent of the Naval Academy at Annapolis in 1870-4; commander-in-chief of the European squadron in 1875-7; and was retired in 1886.

Wordsworth, wérdz'wérth, Charles, Scottish prelate, son of Christopher Wordsworth (1774-1846) (q.v.): b. Lambeth 22 Aug. 1806; d. Saint Andrews, Scotland, 5 Dec. 1892. He was educated at Harrow and Christ Church, Oxford, and, becoming a private tutor, had Gladstone and Manning as pupils. From 1835 to 1846 he was second master at Winchester School, and from 1846 to 1854 was the first warden of Trinity College, Glenalmond, Perthshire. He was elected bishop of Saint Andrews, Dunkeld, and Dunblane in 1852, and was a prominent figure in the ecclesiastical life of Scotland, being filled with an earnest desire to heal the dissensions between the different churches, and pave the way for their reunion. Besides volumes of sermons, discourses, etc., he published a widely-used 'Greek Grammar' (written in Latin) (1839); 'Shakespeare's Knowledge and Use of the Bible' (1864, 4th ed. 1892); 'Annals of My Early Life' (1891). Consult: 'Annals of My Life' (1893), edited by Hodgson; and 'The Episcopate of Charles Wordsworth' (1899) by John Wordsworth.

Wordsworth, Christopher, English Anglican clergyman, youngest brother of William Wordsworth (q.v.): b. Cockermouth, Cumberland, 9 June 1774; d. Buxted, Sussex, 2 Feb. 1846. He was educated at Hawkshead grammar school, and Trinity College, Cambridge, and was elected a fellow of his college in 1798. He held various livings in the Church, and was master of Trinity College 1820-41. He published: 'Ecclesiastical Biography' (1810); 'Sermons on Various Subjects' (1814); 'Christian Institutions,' a series of discourses and tracts (1836); 'Who Wrote Eikon Basilike?' (1824-5); etc.

Wordsworth, Christopher, English Anglican prelate, son of the preceding: b. Lambeth 30 Oct. 1807; d. Harewood, Yorkshire, 21 March 1885. He was educated at Winchester and at Trinity College, Cambridge, and from 1836 to 1844 was head master of Harrow School. He

then became canon of Westminster, and after being made archdeacon of Westminster in 1865 was appointed bishop of Lincoln in 1868. He was the author of writings connected with classical, theological, or ecclesiastical subjects, among which are: 'Athens and Attica' (1836); 'Greece: Pictorial, Descriptive, and Historical' (1839); an edition of 'Theocritus' (1844; fuller one, 1877); 'Memoirs of William Wordsworth' (1851); 'Saint Hippolytus and the Church of Rome in the 3d Century' (1853); 'The New Testament in the Original Greek' (1856-60); 'The Old Testament in the Authorized Version,' with notes and introduction (1864-71); 'A Church History to the Council of Chalcedon, 451 A.D.' (1881-3). Consult 'Life' by his daughter Elizabeth and J. H. Overton (1888).

Wordsworth, Christopher, English Anglican clergyman and scholar, second son of Bishop Christopher Wordsworth (q.v.): b. Westminster 26 March 1848. He was educated at Trinity College, Cambridge, in 1870-88 was a fellow and tutor of Peterhouse College, and in 1877 was appointed rector of Galston, in Rutland. In 1886 he became a prebendary of Lincoln cathedral, and in 1889 rector of Tynemouth, Dorset. Since 1897 he has been rector of St. Peter's, Marlborough. His published works comprise: 'University Society in the 18th Century' (1874); 'Scholae Academicæ' (1877); 'Breviarium ad Usum Sarum' (1879-86), edited with F. Procter; 'Pontificale Ecclesiae S. Andree' (edited 1885); 'Lincoln Cathedral Statutes' (1892-7), edited with H. Bradshaw; 'Coronation of King Charles I.' (1892-4); 'Medieval Services' (1898); etc.

Wordsworth, Dorothy, English writer: b. Cockermouth 25 Dec. 1771; d. Grasmere 25 Jan. 1855. She was the only sister of the poet, and was a woman of remarkable mental powers, who described country life with keen observation and much literary skill. Besides her 'Recollections of a Tour in Scotland' (1874) other journals and letters of hers have been published, the MSS. having been finally collected by Knight in 1897. Her mind was latterly clouded. Consult Lee, 'Dorothy Wordsworth' (1886; new ed. 1894).

Wordsworth, Elizabeth, English educator, daughter of Bishop Christopher Wordsworth (q.v.): b. Harrow 1840. She is principal of Lady Margaret Hall, Oxford, and has published: 'Illustrations of the Creed' (1880); 'Illustrations of the Decalogue' (1893); 'Life of Bishop Christopher Wordsworth' (1888); 'Saint Christopher and Other Poems' (1890); 'The Snow Garden and Other Stories' (1895).

Wordsworth, John, English Anglican prelate, eldest son of Bishop Christopher Wordsworth (q.v.): b. Harrow 21 Sept. 1843. He was educated at New College, Oxford, was ordained deacon in 1867, and in 1868 became an assistant master in Wellington College. In 1870 he was made prebendary of Lincoln, and in 1883-5 was Oriel professor of the interpretation of Holy Scripture, fellow of Oriel, and canon of Rochester. He was Bampton lecturer in 1881 and in 1885 became bishop of Salisbury. His chief publications are: 'Fragments and Specimens of Early Latin' (1874); 'University Sermons of Gospel Subjects' (1878); 'The One Religion' (1881, Bampton Lectures); 'Old

WORDSWORTH

Latin Biblical Texts' (1883-6), with Sanday and White; 'The Holy Communion' (1891); 'Novum Testamentum Latine, secundum editionem S. Hieronymi' (1898); 'The Episcopate of Charles Wordsworth' (1899); 'Teaching of the Church of England for Information of Eastern Christians' (1900); 'The Ministry of Grace' (1901). Died 16 Aug. 19.

Wordsworth, William, English poet: b. Cockermouth, Cumberland, 7 April 1770; d. Rydal Mount, Westmoreland, 23 April 1850. He was the second son of John Wordsworth, attorney-at-law, who was descended from a Yorkshire family dating back to the Norman Conquest. His mother, Anne Cookson, belonged to an ancient family of Crackanorpes, who had lived in Westmoreland from the times of Edward III. He was educated at Hawkshead Grammar School and at Saint John's College, Cambridge, where he entered in 1787, taking his B.A. degree in January 1791. In the summer vacation of 1790 he went to the Continent with Robert Jones, a fellow-collegian, starting, as he says, "staff in hand, without knapsacks, each his necessaries tied up in a pocket handkerchief, with about 20 pounds apiece in our pockets." They spent most of the time in walking through Switzerland.

He left Cambridge with no definite plans for the future. He did not feel himself, as he said afterward, "good enough for the church," and had no inclination to the law. He had studied military history with much interest, and at one time thought of going into the army, but on reflection gave up the plan. He finally went to London, where he lived for a time on a small allowance with no special aim or employment. In November 1791, he went to France, with the idea of spending the winter and learning French, but, becoming interested in the revolutionary politics of the period, remained in the country until October 1792, when his friends, fearing for his safety, stopped his funds, and he reluctantly returned to England.

He soon began to turn his attention to literary work. He had written verse in his school days, at first as a task imposed by his master, the subject assigned being "The Summer Vacation," to which of his own accord he added a poem on "The Return to School." This was before he was 15, for in 1785 he was called upon to write verses in commemoration of the second centennial anniversary of the founding of the school. These, he says, "were much admired—far more than they deserved—for they were but a tame imitation of Pope's versification, and a little in his style." His first publication was in 1792 (not 1793, as generally stated), a thin quarto entitled "An Evening Walk—an Epistle in Verse addressed to a Young Lady from the Lakes of the North of England. By W. Wordsworth, B.A., of Saint John's College, Cambridge." This was followed, the same year, by "Descriptive Sketches in Verse, taken from a Pedestrian Tour in the Italian, Grison, Swiss, and Savoyard Alps." The books attracted little attention, and sold very slowly; but they led to the friendship between Wordsworth and Coleridge, which proved to be a lifelong intimacy. Coleridge says in his "Biographia Literaria": "During the last year of my residence at Cambridge I became acquainted with Mr. Wordsworth's 'Descriptive Sketches,' and seldom, if

ever, was the emergence of an original poetic genius above the literary horizon more evidently announced." Wordsworth himself did not estimate these early poems very highly. In a letter to a friend at the time he says: "It was with great reluctance that I sent those two little works into the world in so imperfect a state. But as I had done nothing by which to distinguish myself at the university, I thought these little things might show that I could do something. They have been treated with unmerited contempt by some of the periodicals, and others have spoken of them in higher terms than they deserved."

In the latter part of 1794 Wordsworth received a legacy of £500 from a young friend, Rainey Calvert, son of the steward of the duke of Norfolk, who owned large estates in Cumberland. They had long been very intimate when Calvert was attacked by consumption, and Wordsworth was his devoted companion and nurse until his death. The poet now felt that he could make a home for himself and his only sister, with whom, the next autumn (1795), he settled down in a cottage at Racedown in Dorsetshire. In July, 1797, they moved to Alfoxden, in Somersetshire, in order to be near Coleridge at Netherstowey. Here Wordsworth added to his income by taking a young son of Basil Montague as pupil; and here he wrote many of the poems included in the "Lyrical Ballads," published in the autumn of 1798 by Mr. Joseph Cottle of Bristol, who had been rash enough to pay 30 guineas (about \$450) for the copyright. The volume contained Coleridge's "Ancient Mariner," which he and Wordsworth had planned together, and to which the latter had contributed a few lines; together with Wordsworth's "Idiot Boy," "We are Seven," and 20 other poems. Among these were the famous lines on "Tintern Abbey," which were written just before the book appeared. Five hundred copies were issued, but most of them were afterward sold to a London bookseller at a sacrifice. When Cottle gave up business soon afterward, his copyrights were transferred to Mr. Longman of London, and in the estimation of their value the "Lyrical Ballads" were put down as "worth nothing." Cottle therefore asked that the copyright might be given back to him, and, the request being granted, he made a present of it to the authors, who both lived to see it become a piece of really valuable literary property. It is not easy to imagine a book containing "The Ancient Mariner" and the "Tintern Abbey" reckoned absolutely worthless, from a commercial point of view, only about a century ago.

Immediately after the publication of the "Lyrical Ballads," Wordsworth, his sister, and Coleridge sailed for Hamburg, with a view of perfecting their acquaintance with the German language by a winter at Goslar. During the four months spent in that dull and dismal town, in a particularly cold and disagreeable season, Wordsworth wrote some of his best and most characteristic poems, full of the loveliness of English rural scenery and life. Coleridge traveled independently of his friends a part of the time they were abroad, but the three made excursions together in the rural districts of Germany, and had some unpleasant experiences. Sometimes they found it difficult to obtain food and shelter in the wretched inns of the country.

WORDSWORTH

In one instance, as Coleridge records, they were actually driven out of doors and had to spend the night in the fields. But they met with no worse misadventures than these, and the Wordsworths got safely back to England in the spring of 1799.

The poet was always fond of travel, and in later years frequently indulged in it both in the British Isles and on the Continent. In August 1802, he went to France again, and in 1803 and 1814 visited Scotland. In 1820 he went with his wife and sister through Switzerland and Italy. In 1823 he traveled in Holland, in 1824 in North Wales, in 1828 in Belgium with Coleridge, and in 1829 in Ireland with his friend Marshall. In 1831 he and his daughter visited Scott at Abbotsford. In 1833 he made another tour in Scotland, and in 1837 a long one in Italy with Crabbe Robinson. In all these journeys he found more or less material and inspiration for his poems.

After his return to England in 1799 he and his sister decided to settle down in their ancestral Lake Country, and soon took a small cottage at Grasmere. Here and in the immediate vicinity the remainder of their lives, except for the occasional journeys abroad, was passed in domestic and poetic seclusion, with few important incidents to disturb the calm current of the lapsing years. In 1802 the poet married Mary Hutchinson, whom he had known from childhood and with whom he had attended the same "dame's school" at Penrith, where his boyhood was partly spent with his mother's parents. After his marriage he and his wife continued to reside with his sister at Grasmere, and there three of his children were born. From 1808 to 1813 the family lived in the same neighborhood in two other houses, and then removed to Rydal Mount, a few miles distant, which was the poet's home for 37 happy years. There, among his native lakes and hills, he died in his eighty-first year.

In his early manhood the poet's resources were very slender, but his tastes were simple and he made what he had suffice for his needs. He and his sister managed to live for six or seven years on about \$500 a year. Later he came into possession of a little property, and later still was appointed stamp-distributor for Cumberland and Westmoreland, an office worth \$500 a year, the duties of which were mostly discharged by a clerk, leaving the poet leisure for his literary pursuits. In 1803 he became acquainted with Sir George Beaumont, a descendant of the dramatist and a cultivated man, who presented him with a beautiful piece of land at Applethwaite, near Skiddaw, hoping that he might be induced to settle there, but he could not make up his mind to leave his chosen home at Grasmere. His friendship with Beaumont remained unbroken until the death of the latter in 1827.

Wordsworth retained the stamp-collectorship until 1842, when it was transferred to his second son. A more lucrative office, the collectorship of Whitehaven, was offered him, but he declined it, being unwilling to exchange his secluded life at Rydal "for riches and a load of care." In 1843, he was made poet-laureate on the death of Southey. He declined the honor at first as imposing duties which at his advanced age he hesitated to undertake; but he finally accepted it, at the personal solicitation of Sir Robert Peel, who assured him that nothing "should be re-

quired of him," adding that the appointment was "a tribute of respect justly due to the first of living poets," that "the queen entirely approved of the nomination," and that there was "one unanimous feeling on the part of all who had heard of the proposal that there could not be a question about the selection."

In 1800 a second edition of 'Lyrical Ballads,' with other poems, was published, and others appeared in 1802 and 1805. Meanwhile the poet had made few friends and many and bitter enemies. The issue of two more volumes of 'Poems' in 1807 led to a fresh onslaught upon the author, who persisted in writing verse after the autocratic 'Edinburgh Review' had given judgment against him. Jeffrey, in noticing the new volumes in the 'Review,' remarked: "Even in the worst of these productions there are, no doubt, occasional little touches of delicate feeling and original fancy; but these are quite lost and obscured in the mass of childishness and simplicity with which they are incorporated." Such was the high critical verdict upon a collection of poems that included the 'Ode to Duty,' the 'Sonnets dedicated to Liberty,' 'The Happy Warrior,' the exquisite lines, "She was a Phantom of Delight," etc., and the sublime 'Ode on the Intimations of Immortality.' Eight years elapsed before another edition of the poems was printed; and the year previous (1814) Wordsworth had published 'The Excursion.' Five hundred copies of this sufficed to supply the demand for six years. The new poem was savagely treated by Jeffrey, who boasted that he had "crushed 'The Excursion.'" Southey remarked: "He might as well seat himself on Skiddaw, and fancy that he crushed the mountain." Jeffrey began his crushing criticism with "This will never do," and went on to pronounce the poem "longer, weaker, and tamer than any of Mr. Wordsworth's other productions"; but though he and his fellow reviewers prevented the sale of the poem, they could not kill it, in spite of its obvious faults.

Other volumes were brought out by the undismayed poet in 1815 ('The White Doe of Rylstone'), in 1819, 1820, and 1822, and all were condemned by the 'Edinburgh Review' as they appeared, but the reaction had now begun among the critical authorities, and henceforth Wordsworth had powerful defenders in literary circles. "War was no longer waged against his poems, but rather concerning them." It was, however, a long fight yet before their rightful position was accorded them by the general consent of the contending parties. De Quincey has well summed up the matter thus: "From 1800 to 1820 the poetry of Wordsworth was trodden under foot; from 1820 to 1830 it was militant; from 1830 and onward it has been triumphant." And the triumph was complete. There were still those who could see little to admire in the meditative measures of the Cumberland recluse, but the general verdict was in his favor, and his place among the great poets of our literature was secure beyond dispute. Honors, too, were conferred upon him. In 1839 he received the degree of D.C.L. from Oxford University; and the enthusiasm of the audience on the occasion was such as had never been known except upon the visits of the Duke of Wellington. One who was present says: "Scarcely had his name been pronounced than from 3,000 voices at once there

WORK—WORKHOUSE

broke forth a burst of applause, echoed and taken up again when it seemed about to die away, and that thrice repeated." The poet no doubt went through the ceremony with his wonted calmness and composure; but it was none the less significant as a tribute to the man and a testimonial that he had fairly won the laurel crown. A few years later, as we have seen, he received the further honors of a government pension and the laureate ship.

Wordsworth's famous theory of poetic art was first set forth in the preface to the second edition of the *'Lyrical Ballads'* (1800), and more at length subsequently in prefaces and appendixes. He took the ground that not only might the poet draw his subjects from common life, but he might treat of them in the language of common life. "I have proposed to myself," he says, "to imitate and, as far as is possible, to adopt the very language of men. . . . I have taken as much pains to avoid what is usually called poetic diction as others ordinarily take to produce it." And again he asserts that "there neither is, nor can be, any essential difference between the language of prose and metrical composition." But his theory was the result of his rebellion against the highly artificial style of Pope and his school, and, like many reformers, he was at first inclined to go too far in the opposite direction. He himself admitted this later by giving up the puerile style in which many of his earlier poems were written, and adopting a more elevated diction, and also by changing some of the most prosaic expressions in those early poems. To take a single brief example of these emendations, in *'The Thorn,'* one of the *'Lyrical Ballads,'* as printed in 1798 and 1815, we have this arithmetical statement:

And to the left, three yards beyond,
You see a little muddy pond
Of water never dry.
I've measured it from side to side,
The three feet long and two feet wide.

Crabbe Robinson told Wordsworth that "he dared not read these lines aloud in company." "They ought to be liked," was the poet's reply; but he nevertheless modified the last two lines in 1820, so that now they read:

Though but of compass small, and bare
To thirsty suns and parching air.

Wordsworth was much gratified at the comparatively early appreciation of his works in this country. The *'Lyrical Ballads'* were reprinted at Philadelphia in 1802, and an edition of his poems in four volumes appeared in Boston in 1824. A complete edition was brought out (Philadelphia 1837) by Prof. Henry Reed, with whom the poet interchanged many letters. In one of these he says: "The acknowledgments which I receive from the vast continent of America are among the most grateful that reach me." Reed's edition was revised and enlarged in 1851. In 1854, a Boston edition in 7 vols. was published, with a biographical introduction (though without his name) by James Russell Lowell. Thirty years later (1884) when Lowell was minister to England, he was made president of the Wordsworth Society, and in the closing words of an address on that occasion he thus aptly and admirably expressed what we may call the "true mission" of the poet:

"As in Catholic countries men go for a time into retreat from the importunate dissonances

of life to collect their better selves again by communion with things that are heavenly and therefore eternal, so this Chartreuse of Wordsworth, dedicated to the Genius of Solitude, will allure to its imperturbable calm the finer natures and the more highly tempered intellects of every generation, so long as man has any intuition of what is most sacred in his own emotions and sympathies, or of whatever in outward nature is the most capable of awakening them and making them operative, whether to console or strengthen. And over the entrance gate to that purifying seclusion shall be inscribed,

Minds innocent and quiet take
This for a hermitage."

The best editions of Wordsworth's poems are Prof. Edward Dowden's (1892) and Prof. William Knight's (1896; a great improvement on his edition of 1882-6). Macmillan's one-volume edition of 1888, with introduction by John Morley, is the next best. Of the *'Selections from Wordsworth'* the best are Matthew Arnold's (London 1879) and the one compiled by Knight and other members of the Wordsworth Society (London 1881). Among the criticisms on the poet those in Principal Shairp's *'Studies in Poetry and Philosophy'* (1876) and his *'Aspects of Poetry'* (1881), and in Stopford Brooke's *'Theology of the English Poets'* (pp. 93-286 being devoted to Wordsworth) may be commended; also the volume entitled *'Wordsworthiana'* (1889), a selection from the papers of the society, including the presidential addresses of Matthew Arnold, Lord Houghton, Lord Selborne, and Mr. Lowell. The society was formed in 1880 and was kept up for seven years. The meetings were held for two years at Grasmere and afterward in London. Beginning as a small semi-private club, it had increased in 1886 to 344 members. The most complete biography of Wordsworth is that by his nephew, Christopher Wordsworth (2 vols. 1851); but the briefer one in *'English Men of Letters,'* by F. W. H. Myers (1881) is, on the whole, to be preferred. Consult also: E. Lee, *'Dorothy Wordsworth'* (1886); Legouis, *'La Jeunesse de William Wordsworth'* (1896). The poet's prose works were collected by the Rev. A. B. Grosart in 1876, and another edition was published by Knight in 1896. W. J. ROLFE,

Author of 'Life of Shakespeare.'

Work, Henry Clay, American song writer and inventor: b. Middletown, Conn., 1 Oct. 1832; d. Hartford, Conn., 8 June 1884. He was a printer for a time, but studied harmony and became widely popular during the Civil War period by his songs, such as *'Kingdom Comin'*; *'Wake Nicodemus'*; *'Babylon is Fallen'*; and *'Marching Through Georgia.'* He wrote also temperance songs, which had a wide circulation, among them, *'Father, Dear Father, Come Home with Me Now'*; and sentimental melodies like *'My Grandfather's Clock'* and *'Lily Dale.'* Among inventions by him were a rotary engine and a knitting machine.

Work, in mechanics. See **ENERGY; MECHANICS.**

Workhouse, in the United States, a correctional prison for petty offenders. In England the poor-house is called a "workhouse." Workhouses appear to have been correctional originally in England also and were first erected as

WORKINGMEN'S ASSOCIATION—WORKSHOP TERMS

the reign of Charles II. in order to compel rogues and vagabonds to work for a living. Act 9, Charles I., ch. vii., entitled the churchwardens or overseers of the poor, with consent of the majority of the inhabitants to establish workhouses for lodging and maintaining the poor, and made various arrangements for union of parishes for this purpose. By 34 and 35 Victoria, ch. cviii., the guardians of every union are bound to provide casual wards, with such fittings as the poor-law board consider necessary, for the accommodation of the casual poor. Every workhouse has to keep a register of religious creeds, and also a register of persons under 16, hired out as servants or apprentices, whom the relieving officer must visit twice a year to inquire into their food and treatment. The inmates of workhouses are not allowed to go out and in at pleasure, and the able-bodied are compelled to work when required. In suitable situations they are often employed in field labor. Married persons are separated unless both are above 60 years of age. Drunkenness, misconduct, or refusal to work, exposes to the penalty of imprisonment with hard labor. The workhouses, after being under the control of the poor-law board, were placed under the local government board in 1891.

In Scotland the legal designation of homes provided for the accommodation of the poor is poor-houses, as in America, the designation "asylum for the poor" being also used in the United States. See CHARITIES, PUBLIC.

Workingmen's Association, International. See INTERNATIONAL WORKINGMEN'S ASSOCIATION; SOCIALISM.

Workingmen's Clubs, organizations for educational and social purposes composed of workingmen, but having none of the benefit or industrial features of the trade-union. In the United States they are not numerous, and where they exist are organized by those interested in philanthropic work for the benefit of workingmen, and are usually largely educational. In Europe, however, clubs are often formed by the workingmen themselves, and are sometimes political, usually socialistic, and sometimes purely social; there are also numerous philanthropic clubs, especially in England, organized generally under church auspices. These are both social and educational.

Workington, wér'king-tón, England, a seaport and manufacturing town in Cumberland, near the mouth of the Derwent, which enters the Solway Firth 33 miles from Carlisle. It has a good harbor furnished with a break-water, and provided with docks. The municipal borough, incorporated 1888, does not include the whole of the previously existing urban district. The town is of importance from its industrial establishments, which comprise large iron-smelting works and works for steel rails, iron plates, etc.; it has a ship-building yard and collieries, and carries on a considerable shipping trade.

Workingwomen's Clubs, organizations for educational and social purposes for workingwomen. The formation of these clubs was begun in Boston in 1890, and they are now numerous throughout the United States; there is a National League of Workingwomen's Clubs; and several State leagues. These clubs have

been organized on the initiative of women outside the working class, and include in their membership both workingwomen and "women of leisure"; one of their great benefits is the promotion of understanding and sympathy between these two classes. The clubs are entirely self-governing, all members being on an equal footing and having equal share in the management. They are also self-supporting by means of moderate fees and the proceeds of entertainments. The club rooms furnish the workingwomen with a place of recreation with pleasant surroundings, and the social feature is emphasized, but the educational side is not neglected; public questions are discussed, and instruction in domestic science, stenography, etc., is given. In some cases the clubs have been instrumental in obtaining reforms in industrial conditions for women; the Massachusetts State League, for instance, was largely influential in establishing the eight-hour day in Boston department stores. See WOMEN IN THE INDUSTRIES.

Workshop Regulations. See FACTORIES AND FACTORY INSPECTION; FACTORY ECONOMICS; CHILD-LABOR; LABOR LEGISLATION; etc.

Workshop Terms. The following list of mechanical terms includes a selected number of the most significant terms and phrases commonly used in workshops to briefly define the various methods, processes, and special operations usually required in the execution of a general line of shopwork, either in wood or metal.

For information relative to similar terms specifically applied to the making and handling of hand and machine tools; to the construction of engines and machines, etc., consult articles under the titles **BOILER TERMS**; **ELECTRICAL TERMS**; **ENGINE**; **ENGINEERING AND STRUCTURAL TERMS**; **FOUNDRY AND FORGE SHOP TERMS**; **LOCOMOTIVE, DESIGN AND CONSTRUCTION OF THE MODERN**; **MECHANICAL TERMS**; **TOOLS**; and **VALVES AND VALVE TERMS**; in this Encyclopedia.

ABOUT SLEDGE.—To deliver heavy blows with a sledge hammer by swinging it through large arc, as distinguished from "Up Hand," meaning the delivering of light blows by swinging the hammer through small arc, or by the use of a lighter hammer.

ABRASION.—The act of wearing away by grinding instead of cutting. It is effected by the use of emery wheels and other forms of grindstones, when cutting tools cannot be used on account of the hardness of the material worked upon, or where the action of such tools would be too slow, or tend to produce inaccurate results.

ADJUSTABLE.—Applied to the peculiar construction of a machine which permits of the regulation of the positions of its various parts as may be required for the execution of different kinds of work.

ALIGNMENT.—The linear accuracy or coincidence of the centres of the fast and loose pulleys of a lathe. Also, the axial continuity of shafting, and of shaft bearings in general.

ANNULAR.—Ring shaped. A term extensively used as a prefix to other terms to designate various forms of gears, valves, valve seatings, engines, etc.

ASBORING.—The shouldering back of a flat bearing face to receive the washers and nuts of the attachment bolts.

ASSEMBLING.—The putting together of the parts of a machine preparatory to the final work of fitting and adjusting. It is especially applicable in cases where such parts are made in great numbers by machinery, and are designed to be interchangeable.

AUTOGENOUS SOLDERING.—The joining of pieces of metal by fusing their contact surfaces, and without the use of solder.

BABBITTING.—The process of lining bearings with Babbitt's metal, or with white metal.

BACKING-OFF.—The cutting away of the "leaving" portion of a screw tap so as to allow the "entering"

WORKSHOP TERMS

- portion to work more freely. It effects a reduction in the friction between the sides of the tapped hole and the portions of the tap which do not cut.
- BACKING-OUT.**—The withdrawing of a tap or die after the thread has been cut.
- BACK.**—Signifies that a dimension is very slightly less than a definite size. So slightly, that the difference cannot be detected by rule measurement, and may be determined only by calipers, that is, a difference less than $\frac{1}{64}$ of an inch.
- BARREN.**—Iron work which has been coated with a film of magnetic oxide by the "Barff" process, to prevent it from rusting.
- BEADING.**—The edge of a sheet of metal thickened or turned over to stiffen and strengthen it. A fillet or strip curved around the edge of a casting to strengthen it, or for ornamental purposes. The semicircular termination of the spigot end of a pipe.
- BEAUMONTAGE.**—A shop term applied to any compound used for filling up holes for purposes of concealment. As prepared for filling up blow-holes in castings, it consists of beeswax, resin, lamp-black and iron borings.
- BENCH WORK.**—Work executed at the bench or vice as distinguished from lathe work, the work of the fitter, or that of the erector.
- BEND.**—The curved part of a pipe by which its axial direction is changed. A bend ought to be of as large a radius as possible in order to reduce the friction of the liquids conveyed by them. They are known as quarter bends, eighth-bends, and sixteenth-bends, having angles of 90° , 45° , and $22\frac{1}{2}^\circ$, respectively.
- BLACK WORK.**—Machine work which has not been machined or polished.
- BLANK.**—A piece of metal specially prepared to be subsequently shaped or ground to some particular form. Blank bolts are the rough forgings of the bolts before the screw threads have been cut.
- BLASTING-OFF.**—Signifies the determination of a definite tempering heat by the flashing point of a grime, fat or oil, into which the article to be tempered is dipped.
- BORING.**—The making or finishing of circular holes of comparatively large diameter, in metal or wood, by the use of tools having one cutting edge only, as distinguished from drilling, which signifies the making of small holes with tools having two cutting edges.
- BRASS BORINGS.**—The borings and turnings of brass castings which are collected in shops. They are separated from the iron borings by the use of magnets, and are then remelted.
- BRASS FITTING.**—A special branch of work involving the later stages of the manufacture of brass cocks, lubricators, valves, and other similar engine and pump fittings. It combines the operations of turning, milling, grinding, and burnishing.
- BRASSING.**—The joining of metallic surfaces by the use of an interposed film of bracing metal, an alloy of 88 parts of copper to two parts of tin. The joints to be braced are first cleaned and bound with wire. Then they are subjected to the action of a clear fire, sprinkled with borax, and heated until the alloy is melted. This process is also known as hard soldering. The proportion of copper in the alloy should be as high as possible, so as to prevent the use of a brazing temperature that would melt the surfaces being braced.
- BROUZE WORK.**—Those parts of a machine which are polished, either to reduce the friction of the bearing parts, or for the purpose of ornamentation. The brightening is accomplished by means of machine centers, or by abrasion.
- BRANCHING.**—The enlarging, smoothing, and turning of drilled holes by the use of a branch or reamer. Branches are sometimes called rose reamers. They are made of various sectional forms, their cutting angles ranging from 90° to 120° .
- BUCKLE.**—Localized inequalities in plates of wood or metal caused by unequal strains and stresses. Buckling is produced in timber by the presence of moisture, by dryness, or by unevenness of grain. In metals, it is caused by unequal stresses set up by variations in density, quality, or in the rate of cooling.
- BURRING.**—Polishing by means of leather and emery, or other abrasive powder.
- BURNISH OR BURNISHING.**—To polish one metallic surface by rubbing with another. Also, to envelope a body by the bending over of a metallic ring around its edges. It is sometimes erroneously applied to the process of buffing.
- BURN.**—The raised and undetached edge of metal turned over when a metal plate is subjected to shearing, or when it is subjected to punching, drilling, or cutting operations in general. Also called burr edge.
- BUSH.**—The internal cylindrical lining of a bearing. Bushes are made of gun metal, or of some kind of anti-friction metal, and are used, either for purposes of economy, or for convenience. In the former case, an inferior metal is lined with one more expensive, thus reducing the total cost, and in the latter case in order to permit of their being replaced when worn out, without replacing the main casting. A bush is undivided, thus being distinguished from a brass, which is divided.
- BUSHING.**—The fitting or driving in of bushes into their seatings.
- BUTT MEASUREMENT.**—The taking of measurements by means of a rule placed against the part measured, as distinguished from measurements taken by the use of transmits, calipers, compasses or dividers.
- CAMBER.**—The amount of curvature given to an initial bar or structure.
- CHAMFER.**—A bevel imparted to edges otherwise rectangular, such as the bevels of nuts, and the rounding ends of bolts.
- CHATTER.**—Caused in machine work by a lack of rigidity in the cutting tools.
- CHIPPING.**—The removal of minute particles of metal from the faces or from the edges of metal work when the amount of metal required to be removed is too large to be accomplished by the use of the file alone.
- CHUCKING.**—The method of attaching lathe work to the various chucks of a lathe.
- CLEARANCE.**—Signifies the amount of space, open or free, between the contiguous parts of a machine. Wheel clearance is the space between contiguous teeth. In the case of brasses, it is the space between their flanges and the collars upon their shafts.
- CLEARANCE ANGLE.**—The angle formed between the face of a cutting tool and the face of the material operated upon. The maintenance of the proper angle is very necessary to prevent the setting-up of undue friction or grinding action between the tool and the work. This angle varies from about 3° in some metal working tools, to about 25° in wood working planes. Also called the angle of relief.
- CLEARING HOLE.**—A hole full to the specified size, so that a turned stud or bolt of the same nominal diameter will pass freely yet closely through it. It is used in opposition to the term tapping hole.
- CLOSING-UP.**—The burring over of a rivet head, either by hand or by hydraulic pressure. The closing-up length required in hand riveting is $\frac{1}{4}$ times the diameter for snap head and conical rivets, once the diameter for countersunk rivets, and about $\frac{1}{4}$ to $\frac{1}{2}$ inch more than the diameter for machine riveting. The term also signifies the covering up of the top box or cope of a foundry mold preparatory to casting.
- CONING.**—The tapering of the running edges of the wheels of railway cars, cranes and turntable rollers. When a train runs around a curve, the wheels are thrown outwards by centrifugal force, and the inner and outer wheels describe arcs of unequal length. By coning, the outer wheels are enabled to run on their greater, and the inner wheels on their lesser diameters, thus compensating for the difference in the arcs described by the wheels, by the difference in the diameters of the wheels.
- COUNTERSINK.**—A hole recessed conically with a countersink, or with a rose bit, or with drills, so that the head of a screw or rivet will lie level with the surface of the material into which it is fitted.
- CROSS CUTTING.**—The removal of material in a transverse direction by the action of a chisel or saw.
- CROW'S FOOT.**—The marks made thus \angle on drawings to indicate the points between which a dimension or measurement is given.
- CUT.**—The removal of a shaving from a piece of work in a lathe, or in a planing, boring, or other similar machine.
- DASSING-ON.**—Applied to the making of butt joints which are strengthened with dowels or stub-in pieces, as in the case of the spoke ends of railway car wheels.
- DEAD SIZE.**—Signifies a finished dimension. It is the opposite of a rough dimension, and is the exact size or length without any allowances whatever for contingencies or for machining.
- DEBurring.**—The hollowing-out of the surface of a disc or wheel so as to render it stronger or more elastic.
- DRAW FILE.**—The polishing of a metallic surface with a file moved transversely of the direction of its own longitudinal axis so that the cutting action of the teeth is very slight. Sometimes called "poker filing."
- DRAWING-DOWN.**—The thinning down of forged work by the use of hammers, fullers and slaters. The dimensions may be reduced all around equally or

WORKSHOP TERMS

- reduced in one direction and increased in the other.
- DRAWING-IN or HITCHING.**—When a cutting tool cuts to a greater depth than that intended for it to cut. Usually due to the improper form of the tool; to an unsuitable cutting angle, or to the improper position of the cutting point relatively to the shank.
- DRAWING-ON.**—Signifies the method by which wheels, pulleys, etc., are attached to their axles or shafts when they are too large to be driven on by a hammer. As commonly applied, long bolts the heads of which are held in a massive cross attached to one end of the axle, pass on the outside of the wheel, or through it between the arms, and the tightening of their nuts against a washer plate placed across the face of the wheel, pulls the wheel into the proper position on the shaft. Hydraulic presses are also used for this purpose.
- DRAFTING.**—The shaping and enlarging of holes by the use of a drift. Also applied to the adjusting of overlapping rivet holes into alignment with each other.
- DRIVING FIT.**—The fit of a bush, a spindle, or of a shaft, when it is driven by the blows of a hammer into the hole bored for its reception.
- DRIVING-HOME.**—The driving of a wheel, shaft, or any other part of a machine to its final and permanent position.
- DRIVING-IN.**—The merging of a hollow radius with a plane surface, as distinguished from the meeting of abrupt angles.
- EAR.**—A lug or projection upon a casting designed for the reception of a bolt or other attachment.
- END MEASUREMENT.**—Measurements taken with a caliper or micrometer gauge. They are very much more accurate than line measurements.
- ERECTING.**—The final building up of machines in readiness for working. The work is accomplished by the "erector," to whom all the work of the turners, planers, slotters, drillers, and fitters is brought, ready to be put together with little or no adjustment being required of them.
- FINALE.**—The recessed part of any piece of work designed for the reception of a dowel or stud.
- FILLET.**—A term of many meanings, and loosely applied to the hollow or to the curves given to the otherwise angular parts of the inner sides of castings; also to a great variety of moldings, beadings, flanges, chipping strips, and to any thin strips employed to give strength, or for ornamental purposes.
- FIT.**—Any thin wafer-like expansion of metal that occurs on the side or edge of a larger portion, such as those on the joints of castings, and on the edges of forgings pressed in dies.
- FINGER.**—A narrow projection of metal used as a guide in various kinds of metal work.
- FITTER.**—A working mechanical engineer whose duty consists of the work of putting together machine or engine parts after they have passed through the hands of the turners, planers, drillers, etc.
- FITTING.**—In a broad sense it defines the duties of the fitter, but in a limited sense it signifies the working-up and finishing by hand of the smaller pieces of metal work which cannot be accomplished by machines.
- FIXED CENTRE.**—A centre, the position of which is localized in space, as distinguished from a movable centre.
- FLUSH.**—The parts of a machine are said to be flush when their surfaces are on the same level.
- FORGING.**—The making of forged or smith's work, and also applied to the work produced by a smith.
- FOURING.**—A class of work turned out on special lathes by means of broad cutting tools, the faces of which correspond exactly to the sections of the pieces to be cut. The value of the method lies in its capacity to produce irregular contours, curved and otherwise, by the use of single tools which ordinarily would require the use of several tools, thereby rendering the attainment of uniformity in many kinds of work practically impossible, or economically difficult. The method is extensively applied to the work of brass finishers and cycle makers.
- FRATTING.**—The abrasion of a cutting tool when it is sharpened on an oil stone.
- FRONTING.**—A finish put upon the exposed surfaces of machine parts for ornamental purposes only. It is effected by scraping with a scraper, or with a small piece of oil stone, a series of the lightest of cuts or scrapings upon the surface of the metal. These cuts are inflicted at different crossing angles from which the light is reflected and produce a very beautiful effect.
- FOUL.**—The term signifies that a dimension is slightly larger than it ought to be, but only so slightly that the excess may be measured only by calipers rather than by rule measurement. When applied to an eccentric, it refers to that part of the obverse which is situated at the greatest distance from the crank-shaft upon which it is fixed.
- GEAR.**—A term widely applied to a great variety of arrangements of toothed wheels, valve motions, pump work, hoisting tackle, ropes, etc. Gearing is a synonymous term, but it is specifically applicable to gear wheels, and also to the driving in and the working of the wooden cogs of mortise wheels.
- GLAZING.**—As used in the workshop, it signifies the filling up of the interstices of the surface of a grindstone, or of an emery wheel, with the minute particles of metal detached by the process of grinding; giving the surface a smooth and polished appearance, and reducing its cutting quality. It is primarily caused either by an insufficient supply of water; by the grinding of material unsuitable to the nature of the stone or wheel; or by the grinding of so broad a surface that the abraded particles of metal are imprisoned by it and are squeezed between the rigid particles composing the grinder.
- GRINDING-IN.**—The process of bringing the bearing surfaces of cylindrical cocks and plugs to an exact fit by the use of emery powder.
- GUMMING.**—The tendency of lubricating oils to become thick and sticky.
- HACKING.**—The dressing-off of the projections on the face of a grindstone which has become so uneven that the effective use of the ordinary pointed grinding tool is rendered very difficult. It is accomplished by means of a chisel-shaped, cross-paired hammer called a hack-hammer, the chief projections being reduced by a series of cross hackings, or chequered cuts.
- HANDING.**—Making symmetrical work right and left hand respectively, and the changing of patterns from right to left hand, and from left to right hand.
- HOLD-UP.**—A common term that expresses the capacity of a piece of wood or metal to finish to a given size.
- IRON TURNING.**—It is the most important branch of mechanical work, and includes all the various kinds of turning connected with the production of all circular bearing parts, and all revolving and close fitting work which has to be turned in power driven, slide rest lathes.
- JACKING-UP.**—The elevating of masses of machinery and heavy structures by means of jacks. Also the planing of the rough outsides of boards with a jack plane.
- JAW.**—A roughed-up or barbed projection of metal produced by sicking underneath, or in front of it, with a cold chisel, or by casting.
- JOINTING.**—The joining together of iron pipes, sockets, etc. The jointing of iron pipes is effected with red lead and boiled oil when the flanges are brought together, while that of sockets is effected with melted lead, with a gasket, or with rubber rings. Hydraulic jointing is accomplished with sal-ammoniac and iron borings. Piston joints for hydraulic work are made of leather pressed into the shape of a cup, while piston joints for steam work are made with metal expansion rings.
- JUMPING-UP.**—The knocking down of the end of a bar of iron upon the anvil so as to thicken the heated portion.
- KEEP.**—The width of the cut produced by the teeth of a saw. It depends upon the amount of set given to the teeth.
- KINK.**—The sharp bend or angle given to a piece of metal by a blow or a strain. It is also applied to the knotting of the links of a chain.
- KNOCKING.**—The noise caused in a pump when the motion for suction and delivery are reversed, and is due to the absence of an air vessel, or one of sufficient area.
- KROTTING.**—A compound, either of shellac and methylated spirit, or of red lead and glue, used for filling-in or covering knots to prevent the absorption of oil paint.
- LAP.**—A body of lead, tin, brass, or other soft metal employed to hold or support the emery or pumice stone used in the grinding of surfaces of hardened steel, chilled iron, and other substances too hard to be attacked with ordinary tools. The character and shape of the lap depends upon the nature of the work performed. Usually the outline of the lap is made similar to that of the work. Lead is used for the commonest grades of work, tin for better grades, and brass for the finest grades. The term is also applied to the extent to which the plates pass over each other in the making of rivet joints, and to a single turn of a rope or chain around the barrel or drum of a hoisting machine.
- LAPPING.**—The polishing and truing up of spindles and circular bearing parts in general, by the use of laps of lead or other material.

WORKSHOP TERMS

- LATHING WORK.**—Work commonly accomplished in the lathe. It embraces practically all kinds of mechanical work accomplished by turning operations.
- LATHING-OUT.**—The marking out of work to full size.
- LAT IN.**—Signifies the sinking in of one portion of wood or metal into another, as in the case of rapping plates which are let in to the patterns, and brass rings let in to sluice cock faces, etc.
- LINING UP.**—The introduction of packing pieces under bearings to compensate for wear.
- MACHINING.**—A general term applied to the operations of turning, planing, shaping, boring, etc., performed on metal work by machines.
- MACHETING.**—The process of separating particles of iron from those of brass and copper turnings by the use of a magnet, prior to remelting.
- MALL.**—A stud or dowel that fits into a recess formed for its reception, in a particular piece of work.
- MANDREL or MANDRIL.**—In a general sense it is applicable to any cylindrical rod of metal. Specifically it is applied to the revolving spindle used for chucking lathe work on; to the spindle of a circular saw; and to the round rod upon which the cuts made by a smith are finished to shape.
- MARKING OUT.**—The workman who marks out the centres and the working lines of metal work preparatory to the operations of the machinists and the fitters.
- METAL SPINNING.**—The process by which light articles made of malleable metal are formed into circular and other shapes by means of pressure applied to them while they are rapidly rotated in a lathe.
- MILLING.**—The method of forming metal into various shapes by means of tools or cutters slowly revolved in milling machines. A greater variety of surface contours can be produced more rapidly and accurately by milling than by the ordinary planing and shaping operations in which single cutting tools are employed. The great value of the method is its capability to produce an indefinite number of articles or machine parts exactly similar in outline, and of uniform size.
- MISAL.**—Lines or edges which meet at an angle of 45° with each other as in the case of any two adjoining sides of a picture frame.
- MORTISE.**—A joint in timber work formed by a recess cut in one piece, and a corresponding tenon in the other.
- MOUNTING.**—The chucking of lathe work.
- MOVABLE CENTRES or MOVABLE POINTS.**—The movable centres of the rods in parallel motions.
- NICKING.**—The cutting of a shallow V-shaped groove around a pipe, or across a bar of metal so that it may be broken by a blow at that particular point.
- OPENING-OUT.**—The enlarging of the diameter of a hole by means of a broach or reamer.
- OUT or TRUTH.**—Signifies inaccuracy in work or materials, such as a sabbled piece of lathe work, or a winding piece of wood or metal.
- OUT AND OUT, or OVER-ALL.**—Signifies an outside dimension taken to its utmost extent.
- OVERHAULING.**—In a general sense it is loosely applied to the examination of machines and machine parts, preparatory to the making of repairs. Specifically, it signifies the pulling down of the stock of a housing chain.
- PATTERN WORK.**—The making of patterns for purposes of casting, turning, milling, etc.
- PLANING.**—The beating over or the smoothing over of a metallic surface with the plane or smaller end of a hammer head.
- PIPE BENDING.**—When metal pipes are bent, any buckling or wrinkling in the inner curve is prevented by filling the pipe with melted resin or some fusible alloy, which tends to preserve its circular form during the process of bending, and which is subsequently melted out of the pipe at the completion of the process. When wrought iron pipes are bent hot, sand is usually employed as a filling instead of an alloy which would be melted by the heat.
- PIPE CONNECTIONS.**—The various parts used in making the joints of pipes, such as bends, tees, unions, elbows, nipples, thimbles, etc.
- PLANING.**—The removal of material from plane or flat surfaces by the use of cutting tools. In the case of small wood work, hand planes are employed; but, in the case of wood work in large quantities or sizes, and in metal work, the operations are performed by the use of planing machines.
- PLANISHING.**—The smoothing and polishing of metallic surfaces by hammering, or by rolling, instead of by cutting or by abrasion. Shafting is very often planished instead of turned. Planishing hammers used on sheet metal are capable of delivering blows at the rate of three hundred blows per minute.
- PLAY.**—The freedom of movement, within definite limits, allowed in bearing or working parts, to prevent their jamming by heating, or by oscillation.
- PLUMB.**—In a vertical position, as indicated by the position of a weighted cord hanging at rest.
- PLY.**—Signifies a fold, a twist, or a single thickness of a material such as wire gauze, or cotton belting. In the latter case, the terms two-ply, three-ply, and four-ply, indicate that the belting is made up of two, three, or four single thicknesses of the material. The term also signifies to bend.
- POSS FIT.**—The fit of adjoining parts which is a little tighter than a sliding fit. It is provided for the purpose of allowing such parts to be pressed together by hydraulic pressure.
- PRISING.**—The turning of a wheel around its axle with a crowbar. Sometimes called "barring."
- PUNCHING.**—The making of holes through metal plates by a punching machine, as distinguished from the making of holes by drilling.
- RAISED WORK.**—Metal work which is produced by being hammered into the required outline.
- RAISING.**—The production of raised work in curved outlines in sheet metal by hammering.
- REAPPA.**—Red lead mixed with oil, and used in the fitting of metal surfaces by the processes of scraping and filing.
- RED LEAD.**—The red oxide of lead. Mixed with boiled oil, or with boiled oil and white lead, it is used in making steam joints, mixed to the consistency of a thin cream paste, it is used for checking the accuracy of contact surfaces during the operations of fitting, the color being transferred from the surface that has been finished to the highest portions of the surface to which the finished surface is being fitted.
- RIVET.**—A double-headed, solid, bolt-like fastening, used for securing metal plates together, when they are subjected to shearing and not to tensile strains. They are made of soft iron, superior in quality to that of the plates, and are pressed into form in dies while red hot. They hold partly by the grip due to contraction on cooling, and partly by the frictional resistance of the plates to slipping.
- RIVETING.**—The forming of the rivet heads in place. The rivets are first heated to a red heat, then they are placed in the rivet holes in the plates, and the tail turned over or clenched by the blows of a hammer. This operation is commonly called closing-up. Large rivets are usually closed-up when red hot, and small rivets when cold, but, if the length between the heads is more than four inches, the heads formed on hot rivets are liable to be broken off by the contraction of the metal when it cools. Rivets of that length and over ought to be closed-up cold. Riveting is accomplished either by the use of hand hammers and hand riveting-sets, which close up and form the tails of the rivets, or by hydraulic pressure. In machine riveting, the closing-up and the forming of the tail are performed in one operation.
- ROUGHING-DOWN or ROUGHING.**—The removal of the outer skin or scale, and the larger bulk of the material from a piece of work preparatory to the more accurate shaping with finishing cuts.
- RULE MEASUREMENTS.**—The taking of all ordinary dimensions with a rule where the character of the work does not require the exactness which can be attained only by the use of calipers, trammels, gauges, and micrometer gauges.
- RUNTING-OUT.**—In boring operations, it signifies the slipping away of the drill from the centre in which it was started. It is caused in various ways, such as the carelessness in the initial centering, the improper setting of the work; the influence of inequalities on the surface of the work; or the bad form of the drill itself.
- RUSTING.**—The coating of bright iron or steel surfaces, such as those of iron patterns, with rust so that they will take shellac varnish without the risk of peeling off. Rusting is accomplished very quickly by coating the iron with a solution of sal-ammoniac, or with a weak solution of hydrochloric acid, and allowing it to dry.
- RYMENDING or REAMING.**—The enlarging of holes, already punched or drilled, by the use of a reamer or reamer. By this method, holes which have been roughly drilled, or those in which ridges have been left by the drill, are smoothed down and made truer, holes which have been punched or drilled in plates, and which do not correspond exactly, are corrected by clamping the plates together and passing the reamer through both of them at once; and punched holes in the immediate vicinity of which local tension has been set up by the punching operations, are relieved of that strain by reaming them about 1-16 of an inch larger in diameter.

WORKSHOP—WORLD

SCALING.—The taking of measurements or dimensions by means of a scale from drawings made full or actual size, or from those upon which the dimensions are not given in figures.

SCRAPING.—A method by which approximately plane surfaces are produced by means of scrapers. Also used in the exact fitting of bearing surfaces, and in the removal of marks or grooves left by the cutting processes. It is a mechanical operation by which the most perfect results in the fitting of contact surfaces are obtained. See *Red Lead*.

SCRIBING.—Marking out with a scribe on rough pieces of wood or metal, the outline of the shape or pattern to which such pieces are to be worked by the subsequent operations. A timber scribe is a steel tool pointed at one end for scratching, and knife-shaped at the other end for cutting. A metal fitter's scribe is pointed at both ends, one being straight for top scribing, and the other curved for marking underneath work.

SET WORK.—Regular work or that which is repeated many times or perpetually in a workshop. It is also applied to any class of work which is made a specialty by a manufacturing concern. In such cases it is accomplished by the minute subdivision of labor and piece work, and is therefore made better and cheaper by such firms; but it tends to develop a very one-sided class of workmen, undoubtedly good in their special line though rather inferior in all other branches of shop work.

SHRINKING-ON.—The fixing or clamping of wheel tires; the securing of the jackets of built-up guns over the central tube, etc., by expanding the wheel or jacket, as the case may be, by means of heat, then placing it in the desired position, and allowing it to grip or tighten on the receiving part by the shrinkage caused by cooling.

SHUTTING.—The welding together of joints in wrought iron or steel.

SLACK FIT.—A term usually employed to denote a bad fit, or the fit of machine parts in contact, which have more play than is sufficient or desirable for their easy movement.

SLIP PRINCIPLE.—A principle of construction upon which the adjacent moving parts of a machine are so fitted to one another with guides or guiding strips, that they can slide or move over each other in one direction only. It is a principle which is applied in one way or another in the construction of all kinds of modern machine tools.

SLIDING FIT.—When cylindrical or plane surfaces move over each other freely, but without any perceptible slackness. The difference of $\frac{1}{10,000}$ th of an inch is equivalent to the difference between a sliding and a slack fit.

SOLDERING.—The joining of two pieces of metal by means of another metal or an alloy. Soft soldering is accomplished by means of the various alloys of lead and tin; while hard soldering or brazing is effected by the use of the alloys of copper and tin. Clean surfaces are essential to effective soldering. In soft soldering a copper bit is used to fuse the alloy, in hard soldering the metal parts are held together by means of binding wire, and the molten alloy allowed to run in between them.

SPINNING.—See *Metal Spinning*.

SQUARING-UP.—A term applied to various methods by which the faces of work are brought into a square position with each other by the use of planes, files, and machine cutters; or to the setting of faces already squared, against the face of a surface plate or marking-off table, preparatory to the scribing of lines and distances.

SWAGING.—The drawing down of wrought metal to a definite form with or without the use of swage tools. It is the reverse of up-setting.

SWEATING OR SWEATING-ON.—The soldering of metallic surfaces without the aid of a copper bit. After being thoroughly cleaned the surfaces are heated and covered with a film of solder. Then they are brought together and heated until the solder flows and unites them. The method is often employed to hold together temporarily various kinds of work which has to be turned or shaped, and which could not be conveniently held in any other manner. The subsequent separation of the parts is easily accomplished by the aid of heat.

TAKING-UP.—A general term which signifies the making of adjustments for wear. Specifically, it denotes the closing up of strap ends of connecting rods, the cone bearings of lathes, compensating collars, etc., and signifies the smooth working of bearing and moving parts, rather than the tightening of parts which are either bolted or wedged together.

TURNING.—The working or cutting of metals with ordinary cutting tools as distinguished from the shaping of surfaces by grinding.

TRAMMELLING-OFF.—The measuring of important dimensions, lengths and centres with trammels. In shopwork, it is the only method recognised as correct, rule measurement being inadmissible.

TRIAL AND ERROR.—A method commonly employed in the workshop to obtain correct work in the construction of mechanisms or in the making of tools. The most accurate results are obtained as follows: When a piece of work has been produced as accurately as possible by the use of a particular set of tools, or by a particular method of construction, some other set of tools, or some other method of construction is resorted to for the detection of the errors left uncorrected by the tools or method previously employed. The production of surface plates and straight edges, and the centring of work in a lathe with chalk, are cases in point.

TAVING-UP.—The straight and accurate planing of wooden surfaces, out of winding and at right angles with each other.

TURNING.—The fashioning of wood and metal work to circular forms in a lathe. It is accomplished either by hand tools, or by power-driven machine tools.

UP-HAND OR UP-HAND SLEDGE.—The delivering of light blows with a smith's sledge-hammer in light work, or the use of a light hammer for that purpose.

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Workop, England, a town of Nottinghamshire, on the Ryton and the Chesterfield Canal; 16 miles east-southeast of Sheffield. It lies near the northern extremity of Sherwood Forest, in a district known as the "Dukery," from the number of ducal seats. Its parish church, dating from 1103, was an ancient Norman abbey church. There are manufactures of agricultural implements, mill machinery, chemicals, etc., and there are iron and brass foundries. Pop. about 18,000.

World, The. Tables showing the total area, number of inhabitants, and density of population of each of the principal divisions of the world's land surface, also the area and density of population of each of the republics and European dependencies in the Western hemisphere, based upon the important work of Alexander Supan, 'Petermann's Mittheilungen, Ergänzungsheft' (Nr. 146, Gotha: 31 March 1904).

The grand total of the earth's population, as shown in this most recent computation, is 1,503,300,000; the total area of the seven divisions or groups, which include all of its continents and islands, is 144,110,600 square kilometres; and the average density of population is 10 persons to one square kilometre. The distribution (re-arranged and condensed with a view to giving prominence to the facts which are of special interest to our readers) is as follows:

	Sq. kilom.	Population to 1 sq. kilom.	Inhabit.
North America (including West India, Mexico, Central America and Panama)	20,817,700	103,714,000	5
South America	17,744,000	38,482,000	2
Europe	9,783,500	323,264,000	40
Asia	44,179,400	819,556,000	18
Africa	29,810,200	148,799,000	5
Australia and Polynesia	8,951,800	6,482,000	0.7
Polar lands (including the Arctic islands, Greenland, Iceland, the Spitzbergen group, Franz-Josef-Land, etc., and the Antarctic mainland and islands)	12,273,000	92,000	...

The total area of the American continents and islands is 38,562,600 square kilometres, and their total population 144,106,000, distributed as follows:

WORLD—WORLD'S COLUMBIAN EXPOSITION

	Sq. kilom.	Inhabitants per sq. kilom.
Canada	8,288,600	0.6
Canadian Lakes, etc.	238,971	.....
Newfoundland	128,670	1.7
St. Pierre and Miquelon	242	37
Bermudas	50	351
United States of America	9,493,970	8
Mexico	1,987,201	7
British Honduras	19,580*	1.9
Guatemala	113,030*	14
Honduras	114,670*	5
Salvador	21,160*	48
Nicaragua	128,340*	5
Costa Rica	48,410*	2
Panama	87,480	2
Cuba	114,000*	14
Haiti	28,676	45
Dominican Republic	48,577*	8
Porto Rico	9,330†	102
British West Indies	32,185†	49
French West Indies	2,858†	136
Dutch West Indies	1,131†	47
Danish West Indies	357†	86
Venezuela	942,300	1.2
British Guiana	246,500‡	0.7
Dutch Guiana	129,100‡	0.4
French Guiana	78,900‡	3
Colombia	1,206,200*	4
Ecuador	299,600*	7.3
Peru	1,137,000*	1.7
Bolivia	1,334,200*	3
Brazil	8,361,350*	5
Paraguay	253,100*	1.7
Uruguay	178,700*	0.2
Argentina	2,806,400*	4
Falkland Islands	12,532	.....
Chile	759,000*	.....

* But compare figures in articles under these titles.

† See WEST INDIES.

‡ See GUIANA.

The total population of Latin-America, if we include in that designation all countries and islands directly south or southeast of the United States, excepting parts of the British and Dutch possessions, is approximately 63,000,000. For the population of each of the foregoing Latin-American political divisions, and area of each in square miles, with explanation of the uncertainty that exists as to the exact figures, see separate titles; also *ACR.*

Revised by MARRION WILCOX.

World, Armament of the. See *ARMAMENT OF THE WORLD.*

World-English, the name given by Prof. A. Melville Bell to a proposed new phonetic system of spelling the English language, so as to render its acquirement by foreigners more easy, and to make it available for international use.

World's Columbian Exposition, an international exposition held in Chicago, Ill., in 1893, to celebrate the 400th anniversary of the discovery of America by Columbus.

History.—The fitness of some special celebration of the discovery of America had been recognized and the question agitated several years before the bill providing for a Columbian Exposition was introduced in Congress in 1889. Several cities urged their claims for the site of the exposition; chief among them were New York, Chicago, Washington, and Saint Louis; Chicago was finally chosen as the site, and the bill passed and approved 25 April 1890. The organization of the fair was placed under the charge of an Illinois corporation previously organized, and the World's Columbian Commission, a national commission consisting of delegates appointed two from each State and Territory,

two from the District of Columbia, and eight at large. Harlow N. Higginbotham was president of the former, and Thomas W. Palmer of the latter; George R. Davis was appointed director-general. Exposition headquarters were established in Chicago in January 1891. A Department of Publicity and Promotion was established, and a Board of Lady Managers with Mrs. Potter Palmer at its head, and a World's Congress Auxiliary with C. C. Bonner as president were organized. The work of construction was placed under the charge of a Bureau of Construction of which Daniel H. Burnham was chief; work was begun on the first building in July 1891. On 23 Oct. 1892 the buildings were formally dedicated by the Vice-President of the United States; the dedication ceremony, which was attended by 130,000 people, was held in the Manufactures and Liberal Arts Building. The exposition was formally opened 1 May 1893 by President Cleveland; at the moment when he declared the fair open the flags of the various nations were unfurled, the electric fountains turned on, and the statue of "The Republic" unveiled. The attendance at the fair increased toward the close; the days showing the largest attendance were 9 October, Chicago Day, and 4 July, American Independence Day; the average daily attendance was 172,712. The exposition was formally closed 30 October; preparations had been made for elaborate closing ceremonies, but the assassination of Mayor Harrison of Chicago two days previous prevented the carrying out of the proposed programme.

Financial.—The bill providing for the exposition required the city of Chicago to raise \$10,000,000 toward the expenses; later Congress provided for the gift of a special mintage of \$2,500,000 in souvenir half-dollars, the exposition authorities also issued \$5,000,000 worth of debenture bonds; about \$3,000,000 additional were received from other miscellaneous sources, so that about \$20,000,000 was available before the opening; the total expenditures for the fair were over \$31,000,000, and the profits about \$1,850,000. The United States Government appropriated \$2,250,000 to its exhibits, the States \$6,060,350, the foreign governments \$5,830,000, and over \$350,000 was invested in the Midway Plaisance.

Buildings and Principal Exhibits.—The site chosen for the exposition was Jackson Park, a portion of the South Park system of Chicago; it covered 666 acres and extended about two miles along the shore of Lake Michigan. There were about 130 buildings erected; the more important were built of the material called "staff," a composition of plaster of Paris and jute fibre, which produced the general effect of white marble, hence the exposition grounds became generally known as the White City. One channel from the lake led into a pond in the southern part of the grounds, and north of this another channel led into a long basin; this second channel passed underneath a handsome bridge and colonnade. The basin was joined by an artificial canal to the lagoon, a small lake, containing Wooded Island. About the basin and lagoon the principal buildings were grouped. The space about the basin was known as the Court of Honor. The Manufactures and Liberal Arts Building faced the lake near the eastern end of the basin; this was the largest building ever constructed for an exposition; it cov-

WORLD'S COMMERCE

ered nearly 31 acres; the main roof was of iron and glass. At the head of the basin was the Administration Building, with its gilded dome; near this were the Agricultural Building, Machinery Hall, and the Electrical and Mining Building. On the west of the lagoon were the Transportation Building and Horticultural Hall, and on the east the Government Building, with a large dome 150 feet high; at the northwestern end of the lagoon was the Woman's Building, and at the northeastern end the Fisheries Building. Still further to the north were the State buildings, many of the foreign nations' exhibits, and the Fine Arts Building. The Fine Arts Building was an example of purely classical architecture; it was entered by four richly ornamented portals. The State and foreign nations' buildings were in many cases copies of some characteristic historic building or type; as, for example, Virginia's building was modeled on Washington's Mount Vernon home, Massachusetts' was a copy of John Hancock's house; England's represented a manor house of the time of Henry VIII., and Spain's the convent of La Rabida. In the southern part of the grounds was the Forestry Building, built in the rustic style; the columns supporting the roof being made of tree trunks furnished by the different nations and the States and Territories of the United States. Near the Forestry Building were a number of the small exhibits, the Krupp exhibit, dairy, etc. The Manufactures and Liberal Arts Building included in its exhibit everything related to engineering, architecture, publishing, technical and domestic arts, together with education, the professions, music, and the drama. The Fine Arts exhibit included many masterpieces of painting and sculpture, the Woman's Building contained a collection representing woman's work in all lines of activity; the Transportation Building's collection represented all modes of transportation from the most primitive to the most complete modern inventions of ocean steamers and locomotives; and the exhibits of the other special departments of human industry showed most excellently the progress of the race in each special industry. The architectural effect of the buildings was enhanced at night by the use of electric lights outlining the buildings, search lights, and the electric fountains playing in changing colors.

Special Features.—Among the special features of the exposition the Midway Plaisance was perhaps most interesting; on this were represented the villages of different nations and peoples, including the Irish village, the Japanese village, the Japanese bazaar, the Samoan and Dahomey villages, etc.; here also were the "Street of Cairo," and the various amusement features; and the Ferris wheel, 250 feet in diameter, carrying 36 coaches. Other special exhibitions of interest outside the main buildings were the reproduction of the cliff dwellers' buildings at Battle Rock Mountain, Colo.; the models of Columbus' three caravels, of the Viking ship, and of a modern United States battleship. Another interesting feature of the exposition was the numerous world's congresses held on the grounds under the auspices of the World's Congress Auxiliary. These congresses discussed the leading phases of professional, scientific, economic, educational and religious thought; the World's Parliament of Religions probably attracted the most general attention.

World's Commerce. The commercial status of each nation in the world is properly judged by the total value of its exports year by year, compared with those of other nations. On this basis the United Kingdom leads. The value of each nation commercially to the other nations rests upon the total imports. In this respect Great Britain leads, with Germany second and the United States third. Were it not for its protective tariff the United States, with its gigantic, heavily-consuming home market, would lead and lead immeasurably, to the detriment of its manufacturers, merchants, farmers and wage-earners alike. Expressed in round millions the exporting and importing rank of each nation in the world, with the share of the United States therein, is shown to be as follows, quoting the Statistical Abstract of the United States, 1909:

(Add 100,000 to the figures)	Exports	To the United States	Imports	From the United States
United Kingdom.....	\$1,835	\$103	\$2,225	\$604
United States.....	1,638	...	1,311	...
German Empire.....	1,522	120	1,824	305
France.....	974	60	1,088	120
Netherlands.....	879	81	1,129	129
British Colonies.....	615	34	557	38
Russia.....	548	4	436	28
British India.....	486	48	417	10
Belgium.....	483	14	441	65
Austria-Hungary.....	457	11	486	44
Argentina.....	353	12	263	34
Italy.....	333	39	563	78
Australasia.....	308	11	242	69
Switzerland.....	287	11	200	21
Canada.....	232	68	296	100
Brazil.....	214	85	173	20
Japan and Pescadores.....	204	65	196	26
China.....	178	15	254	26
Denmark.....	165	6	190	30
Spain.....	153	7	167	23
Dutch East Indies.....	146	7	91	1
Sweden.....	129	8	163	16
French Africa.....	128	1	94	...
Chile.....	116	16	97	8
Mexico.....	115	86	77	45
Cuba.....	113	99	85	42
Rumania.....	106	...	83	...
Egypt.....	103	5	119	1
Turkey.....	84	11	133	1
Norway.....	64	1	100	4
Finland.....	51	...	45	8
French East Indies.....	48	...	73	...
French Colonies.....	42	...	45	3
Uruguay.....	37	8	34	3
Siam.....	36	...	27	...
Portugal.....	32	...	66	6
Philippine Islands.....	30	10	27	4
Peru.....	26	5	25	5
Paraguay.....	25	...	31	...
Bolivia.....	24	...	20	4
Greece.....	22	8	28	1
Bulgaria.....	21	...	25	...
Serbia.....	19	...	14	...
Venezuela.....	14	...	10	3
Colombia.....	14	6	15	3
Ecuador.....	12	3	10	1
German Colonies.....	9	...	21	...
Santo Domingo.....	9	2	4	8
Korea.....	8	...	20	1
Costa Rica.....	7	4	5	2
Guatemala.....	6	1	5	1
San Salvador.....	5	2	4	1
Nicaragua.....	4	1	3	1
Haiti.....	3	...	4	3
Paraguay.....	3	...	3	...
Honduras.....	2	1	2	1

Exports.....	\$15,426,000,000
Imports.....	15,253,169,000
World's commerce.....	\$30,679,169,000
Exports.....	\$1,099,731,000
Imports.....	2,015,390,000
Total United States share.....	\$3,115,121,000

WORLD'S SILK INDUSTRY

Except for some trifling fractions of value the Statistical Abstract shows that America is not doing business either way with Bulgaria, French East Indies, Siam, Servia, Persia, Paraguay, Rumania, Korea, the German colonies or Bolivia. The American trade with Norway is included in the figures for Sweden, and that with Finland forms part of the small totals of our exports to and our imports from that empire. The total commerce of the United States with Russia was only \$14,000,000 of her \$697,000,000 total foreign commerce, while with Japan we did \$62,000,000 (four and one half times as much as with Russia), of her \$774,000,000 total foreign trade. In other words, the United States did not share in \$683,000,000 Russian business, while Japan did only \$212,000,000 outside of us. That is more than three to one in favor of Japan in its prospective value tons as buyer and seller. See **COMMERCE**.

World's Silk Industry, The. The French French silk experts estimate the production of raw silk in the world at 70,000,000 pounds, with a valuation of \$475,000,000 annually in finished goods. At best, however, the estimates are arbitrary, on account of the inability of the best informed to determine with accuracy the raw silk production in the Oriental countries. In Asia, as in Europe, the coarser and inferior silks are kept at home; America, which is now the largest purchasing silk market in the world, uses only the finest and best. What may be called "country silk" is reeled in households and by primitive methods and is suited only for hand-loom and the cheapest labor and the cheapest fabrics. The silk production of China, Japan, India, Tonquin, and Annam is estimated as 32,000,000 pounds. Possibly one half of this may not improperly be classed as "country silk." A percentage of "country silk" is also raised and used in Italy, the Caucasus, Brutia, Syria, Persia, and Turkestan. It is only in the countries where labor is low-priced that these inferior silks can be manipulated to advantage in the manufacturing processes. By "country silk" is meant raw silk not usually classed as suitable for export, and though some of it is shipped to Europe for manufacturing the cheapest grades of silk, it cuts no figure in the American market.

France.—Power loom weaving was not introduced in France until after the successful experiments in Switzerland. The beginning of the precedence of Lyons was first attained in the 16th century. By that time the industry had concentrated there. Earlier silk-making had flourished at Avignon under the patronage of the popes; then the manufacture was divided and was equally recognized at Tours (1480), Paris, Nîmes, and Lyons (1520); finally the latter place drew to itself the chief importance. Here were used the best Italian and Spanish raw silks, and soon the large purchases made by Germany and the Netherlands gave great impetus to the industry in France. Lyons gained in prosperity over the other French towns, because, for one reason, it was exceptionally well favored by its geographical position. The four annual fairs held at Lyons drew people from remote distances, merchants, manufacturers, travelers, and Italians who established themselves there in silk-weaving colonies. In 1600 the town had a couple of thousand looms. Before the Edict of Nantes (1685) there were 18,000 looms. From 5,000 in 1701 the number increased to

15,000 in 1785. Later came the Revolution and the looms decreased again to about 5,000. Then the times mended, and France and Lyons began slowly to recover their prestige in the manufacture of silk. A count in 1873 showed 110,000 hand looms at Lyons and the country within a radius of 40 miles. In 1887 the increase had resulted in 145,000 looms; and the product, 400,000,000 francs or \$80,000,000, represented two thirds of the output of France. The remaining third was divided between Saint Etienne, Saint Chamond (the ribbon centres), Paris, Nîmes, Tours, and Calais. The year 1865 is fixed as the apogee of prosperity at Lyons. Previous to that period there had been a great and constant demand from the United States. As soon as Switzerland, Germany, and the United States began to make some distinctive showing in silk manufacture, it was understood in France that competition had arisen to reduce the cost of the production. Progress in the construction of machinery permitted these countries to produce equally well similar goods, and destroyed the personal superiority of the workman. Customs barriers were also raised against the Lyons trade. Fashion, giving vogue to low-priced goods that could easily be produced, moreover, paralyzed a portion of the Lyons manufacture. It is enumerated that it became essential to produce "stuffs the most simple" and also goods mixed with cotton and woolen. Dyeing in the piece was undertaken. Tulle and crepe had been the only products woven in the raw. During the 30 years though, from 1870 to 1900, every kind of plain and figured weave was tried in France in raw silk. The art of the dyer and finisher, it is asserted, was carried forward to perfection. The power loom was also introduced; and a low price in production was sought in the delicacy of the raw silk used, together with the rapidity of the loom. The number of power or "mechanical looms" in 1873 was only 7,000; but in seven years these increased to 20,000. In 1894 they numbered 25,000 and in 1900, 30,638. The production of mixed silks, which was about 30,000,000 francs before 1870, rose to 60,000,000 in 1878, to 160,000,000 in 1890. It is pointed out that the manufacturers at Lyons, with an extraordinary suppleness, equaled by the rapidity of execution the mobility of the fashions. They passed from plain to figured goods, from the costly to the low-priced, from all silk weaves to silk mixed with cotton and wool. These articles varied without limit, taffetas, satins, velvets, plushes, poplins, foulards, laces, silks for linings, umbrellas, figured silks for upholstery, and passementeries. One of the secrets of strength, it is said, was in the division of labor. Every manufacturer, and all the succession of operatives whom they employed, concentrated their attention on one species of weave and stuck to it with the best results.

From the very beginning of 1861, when the silk duties in England were removed by its free trade policy, the French silk manufacturers greatly profited by sending their goods in large consignments across the Channel. English consumers were seduced by the novelty of the goods, and were influenced by the Parisian modes.

France, with its competitors, has the advantage of getting its inspiration from the world.

WORLD'S SILK INDUSTRY

It sends its products to every market in Europe, to Asia, Africa, and America. Its success is displayed by the figures of exportation of silks which fluctuate between 250,000,000 and 350,000,000 francs, according to the price of silk in the raw and following the nature, low or advanced, of the goods required for consumption. France absorbs a great part of the silk raised by Asia for the commerce of the West. In 1890 it employed 4,500,000 kilograms of raw silk and 800,000 kilograms of waste silk. In 1900 its consumption of raw silk was 400,000 kilograms less. Following are the figures of the Lyons production, and the exports and imports for all France in 1900:

amounted in value to \$20,000,000 annually. Half of this output was taken by the continent. At Crefeld, where, in 1883, there were 39,463 hand looms and 1,467 power looms, the manufacture is more varied. About half the looms in those days, though, were devoted to velvets and plushes. Cotton played a great part in the manufacture. It was estimated that Crefeld made use of 2,200,000 pounds of cotton, 8,000,000 pounds of schappe or spun silk, and 8,800,000 pounds of reeled silk. The growing industry in the United States in the manufacture of velvets has decreased the output at Crefeld very noticeably in the last few years. From one half to two thirds of all the silk goods manufactured

FRANCE

1900 Description	Lyons Production Silk piece goods France	All France Export Silk piece goods and ribbons France	All France Imports Silk piece goods and Ribbons France
All silk goods.....	172,300,000	75,122,000	38,613,000
All silk jacquard.....	20,800,000	3,250,000	.....
Silk mixed.....	114,850,000	88,049,000	7,541,000
jacquard.....	18,250,000	.....	.....
with gold and silver.....	6,300,000	.....	.....
Mousselines, gauzes, grenadines and crepes.....	66,200,000	3,850,000	5,438,000
Tulles, laces, and confections.....	42,450,000	87,817,000	10,418,000
	piece goods only	including ribbons	including ribbons
Total	441,350,000	258,088,000	62,010,000
		Distribution	Imports from
To United States.....	.....	51,496,000	.....
To England.....	.....	115,111,000	10,282,000
To Germany.....	.....	18,295,000	9,410,000
To Belgium.....	.....	12,336,000	.....
To Switzerland.....	.....	11,021,000	18,154,000
To Turkey.....	.....	5,962,000	.....
To Spain.....	.....	5,681,000	.....
To Italy.....	.....	2,939,000	754,000
To Austria-Hungary.....	.....	1,397,000	176,000
To Russia.....	.....	805,000	.....
To South America.....	.....	1,446,000	.....
To all other countries.....	.....	31,579,000	23,234,000
Total .....	.....	258,088,000	62,010,000

Value of franc in United States currency 19.3 cents.

The exports of silk goods from France have greatly fallen off since 1870. In that year they were 134,352,872 francs, to the United States alone, and to all countries 485,093,505 francs. In 1870 France exported plain silk dress goods alone to the value of over 350,000,000 francs.

Additional silk production in France in 1900 amounted to 85,000,000 francs, ribbons at St. Etienne, and 110,000,000 francs, laces and novelties at Calais, Le Nord and Paris.

Germany is next in importance to France in silk manufacture in Europe. The silk industry was established in Germany first at Berlin. The workmen were French, going from France about 1685. After 20 years, however, there were not more than 1,000 looms. Later, in order to take advantage of the cheap labor offered elsewhere, the Berlin manufacturers went to Crefeld, Elberfeld, Barmen, Weiser, and Ronsdorf. These places became the centres of the industry. They began to make a specialty first of velvets and next of ribbons and piece goods of mixed materials. The total of the looms in 1844 was estimated to be 25,000. After a decade the increase made them number about 42,000. In 1873 they counted 87,000. The product in 1844 amounted to about \$18,000,000, or 72,000,000 marks. That value had been raised in 1873 to 180,000,000 marks, or \$45,000,000. Three fifths of the product was then in velvets and plushes. When 15 more years had come and gone there were in 1887, at Elberfeld, Barmen, Ronsdorf, and the Grand Duchy of Baden 30,000 looms, making goods, chiefly ribbons, for export that

at Crefeld, of whatever sort, are for export, chiefly to England and the United States. The loom equipment in 1901 at that manufacturing centre was 11,939 power looms and 6,293 hand looms. The table on the following page gives the figures of silk production (piece goods and velvets) in Crefeld, and the exports and imports for all Germany in 1900.

Switzerland.—In Switzerland, the first silk power loom weaving on the continent on the factory system was inaugurated by the Schwarzenbachs at Adliswil. It was in 1860 that the industrial experiment was successfully tried by waterpower. The enterprise of the Schwarzenbachs finally enlarged the plant, but there are many difficulties in introducing new methods in silk weaving. It will be remembered that Vaucanson was set upon by rival weavers at Lyons in 1744, and soundly beaten for his temerity in introducing a new system of weaving. Among the familiar difficulties that formerly had to be overcome in the successful introduction of labor saving mechanisms may be mentioned: (1) The natural or inherent prejudice by the "operative-

WORLD'S SILK INDUSTRY

GERMANY.

1900 Description	Crefeld Production Piece goods, silk mixed and velvets Marks	All Germany Exports Piece goods, silk mixed, and vel- vets Marks	All Germany Imports Piece goods and silk mixed Marks	
Piece goods, all silk.....	57,269,895	13,874,000	17,276,000	
Silk mixed.....		28,733,000	4,133,000	
Velvets and plushes.....	24,043,044			
Total	82,232,939	102,607,000	21,409,000	
	Distribution		Imports from	
To Germany	44,198,460		4,614,000	Switzerland
To Austria-Hungary	2,136,680		1,471,000	Austria-Hungary
To England	17,135,932		2,004,000	England
To France	3,817,076		9,857,000	France
To other European countries.....	4,796,800		643,000	Italy
To other than European countries including United States.....	10,146,371		2,364,000	Eastern Asia
Total	82,232,939		21,409,000	Other countries
		Distribution Marks		
To United States, all silk.....		870,000		
To United States, silk mixed.....		19,861,000		
To France, both.....		6,809,000		
To Belgium and Holland, both.....		7,317,000		
To Denmark, Sweden, Norway.....		5,782,000		
To England, both		41,127,000		
To Switzerland, both.....		3,326,000		
To Austria-Hungary, both.....		8,672,000		
To Italy, both		1,878,000		
To other European countries, both.....		5,072,000		
To British possessions.....		3,569,000		
To Central and South America.....		2,934,000		
To all other countries.....		1,390,000		
Total		102,607,000		

Value of mark in United States currency 23.8 cents.

In southern Germany there are 3,692 power looms, which, being operated by Swiss ownership, are commercially known as "Swiss Production." The value of this production in 1900 was 17,600,000 marks. There are also a number of silk establishments making gloves, knit goods, laces and passementerie in Saxony, and umbrella silks in other parts of Germany, concerning whose statistics and production no reliable information is available. The silk ribbon industry at Elberfeld and Barmen is likewise for the same reason not included in foregoing figures.

class against any and all new systems. (2) The natural longing in favor of the old ways or customs. (3) The slow advance in educating operatives. (4) The unwillingness of operatives to favor a factory system, which through systematized control and discipline enables the same operative to work a far less number of hours and for better pay than was possible under the individual or independent system. These prejudices were very strong 40 years ago in all countries. In England the male operatives rose *en masse* against the introduction of steam power in the mills and factories. On the continent no woman could withstand the opprobrium of being called a "factory girl." Even in progressive Switzerland progress was at first very slow in familiarizing the population with the new method of weaving. Switzerland depends considerably on America for a market. Like the industry in Germany, the silk making in Switzerland is the result of a few looms scattered here and there in the country at the end of the 18th century. The operatives combined agriculture with weaving. The centres of the production finally became Zürich and Basel, the latter devoted to ribbons. In 1811, Zürich possessed 7,000 looms, producing silks valued at \$1,000,000; in 1830, the return was 9,000 looms; in 1839, 15,000; in 1855 the number of looms had

risen to 25,000; in 1872, to 27,000; in 1883, about 30,000 were scattered in the canton of Zürich and the neighboring cantons of Zug, Schwyz, and Unterwalden. Thereafter the number of hand looms began to decrease, and the number of power or mechanical looms to increase. There were in 1871 only 920 mechanical looms; but that number was increased in 1881 to 3,151, and to 4,129 in 1885. Since then the progress has been constant. In 1891 they numbered 7,173, in 1895, 9,609, and in 1900, 13,326. Of this number 11,163 were employed on plain and twilled weaves, 2,133 on Jacquard weaves, and 30 were velvet looms. There were also 8,563 power looms in factories beyond the Swiss frontier, but working for Swiss firms. The number of hand looms in Switzerland had decreased in 1900 to 19,544, and 2,300 additional were in factories beyond the Swiss frontier, but working for Swiss firms. A total of 46,619 persons were employed in 1900, 24,816 being employed in the hand-weaving branch (but many of these do not weave during the summer months), and 15,475 in the power-weaving branch. About 4,000 persons are employed in the throwing mills, 2,000 in silk dyeing, 322 in silk finishing and 43 in "conditioning" houses. The raw materials consumed in 1900 were 2,566,379 pounds of raw silk, 26,506 pounds of

WORLD'S SILK INDUSTRY

"schappe" or spun silk, 920,233 pounds of cotton yarns, and 8,085 pounds of wool and other yarns.

In 1900 the exportation of silk piece goods from Switzerland was \$20,000,000. The consumers are the English, French, Americans, and Germans; about \$730,000 worth goes to Austria. Belgium and Holland together take \$650,000. At Basel the production of ribbons amounted in value in 1846 to 20,000,000 francs; in 1857, to 45,000,000; in 1862, 31,000,000; in 1872, to 65,000,000, or \$13,000,000. Later the production presented considerable variation, and the fall was often to 30,000,000 francs a year, due to the growth of the manufacture of ribbons in the United States. But the annual production in Switzerland of broad goods, ribbons, and laces reached a value in 1900 of about \$38,000,000. The exports of silk piece goods from Switzerland have shown a constant increase since 1890, with the exception of 1893-4, which was a bad year for the silk industry in all countries. The increase in the exports since 1890 has been 37 per cent. Swiss silk manufacturers concede that 95 per cent of their production is for export. The following table shows in detail the production, exports, and imports of silk piece goods in 1900:

Genoa; and at Turin the manufacture includes a variety of goods. Sicily is devoted chiefly to the manufacture of ribbons. At the beginning of the 17th century there were several weaving shops as well as a few velvet looms in Como, but it took about 150 years more before there was an improvement worth mentioning in the silk industry. In the province of Como alone in 1900 there were 32 manufacturers with 3,965 power looms; in the province of Milan, 7 manufacturers with 3,360 power looms, and in other provinces of northern Italy 5 manufacturers with 795 power looms. The total Italian output annually was reckoned in 1901 the equivalent of about \$14,000,000, the loom equipment of Italy being 8,400 power looms and 11,000 hand looms. The indicated imports and exports of silk piece goods, etc., in 1901, are shown on the following page. The value of the exports average \$6.00 per pound, and the value of the imports \$7.00 per pound. The exports of silk fabrics from Italy to Great Britain have greatly increased in recent years, having more than doubled since 1897, and quadrupled in quantity since 1895. It is evident likewise that the Italians are able to manufacture more successfully, as their silk goods exports to all countries were

SWITZERLAND.

1900 DESCRIPTION	Production Zürich only Silk piece goods Francs	Export Piece goods Francs	Imports Silk piece goods Francs
Silk piece goods.....	113,460,000	.....	9,404,681
All silk stuff and shawls.....	91,323,941	.....
Spun silk stuffs.....	57,806	.....
Silk mixed stuffs and shawls.....	14,312,586	.....
Bolting cloth.....	4,289,605	.....
Total	113,460,000	109,982,938	9,404,681
Distribution			
To United States.....	16,579,780	.....
To Great Britain and Canada.....	48,426,162	.....
To France.....	15,886,763	.....
To Germany.....	6,625,975	.....
To Austria-Hungary.....	4,224,643	.....
To Belgium and Holland.....	3,304,121	.....
To Central and South America.....	2,719,616	.....
To all other countries.....	7,926,273	.....
Total	109,982,938	.....

Value of franc in United States currency 19.3 cents.
At Basel, in addition, about 80,000,000 francs worth of ribbons are now produced annually, Great Britain being the largest consumer.

Italy.—It is estimated that Italy now employs about 1,500,000 persons in her sericulture. The average yield of raw silk is about 10,000,000 pounds reeled from Italian cocoons, and another 2,000,000 pounds adding the reeling of imported cocoons. The value of the silk crop at the prices of the past few years averages \$45,000,000 to \$50,000,000. About 80 per cent of the output is exported to supply the silk manufacturers of France, Switzerland, Germany, Russia, England, and the United States, the remainder being consumed in the silk industry at home. In Italy, once the land of the gorgeous velvets of Genoa, the damasks and brocades of mediæval Sicily, Venice, and Florence, the centre now is at Como. Velvets are still made, however, in

165 per cent greater in quantity in 1901 than in 1895, and but 150 per cent greater in value.

Great Britain.—The earliest historical notice known to us of the silk manufacture in England is contained in an Act of Parliament passed in 1363, during the reign of Edward III., making exception to certain restrictions named in the act against merchants, shopkeepers, and manufacturers in favor of certain employments, silk being one of the number. In 1454, during the reign of Henry VI. a law was passed protecting the silk women of London against the importation of narrow silk fabrics, such as ribbons, fringes, trimmings, and embroideries. In 1463 a further act prohibited the importation of laces, ribbons, silk, fringes, and similar goods.

WORLD'S SILK INDUSTRY

ITALY.

1901 Description	Production Silk piece goods France	Export Silk piece goods		Exports France
		Quantity Kilograms	Value Lire	
Silk piece goods.....	70,000,000	.....	.....	Silk piece goods
All silk.....	209,152	12,130,816	10,357,000
Black, plain.....	12,915	878,220	Laces, ribbons,
Black, jacquard.....	544,040	40,803,000	passenteries
Colors, plain.....	63,815	5,424,275	and confections
Colors, jacquard.....	13,069,000
Mufflers and scarfs
Plain.....	706	59,304	.....
Jacquard.....
Silk mixed weaves
Black, plain.....	74,752	1,943,552	.....
Black jacquard.....	856	27,392	.....
Colors, plain.....	121,562	4,862,480	.....
Colors, jacquard.....	48,537	2,329,776	.....
Grenadine and chiffon weave
Plain.....	535	37,450	.....
Jacquard.....
Spun silk weaves.....	22,886	595,036	.....
Wearing apparel.....	29,589	3,698,625	.....
Velvets, tulles, plushes, passementerie, etc.....	44,629	2,709,913	.....
Total.....	70,000,000	1,173,974	75,499,839	23,426,000
Distribution				
		Kilograms	Value to each country not given	.....
To United States.....	48,278	.....	.....
To Great Britain.....	403,617	.....	.....
To Switzerland.....	185,432	.....	.....
To Germany.....	105,065	.....	.....
To Turkey.....	105,274	.....	.....
To Africa.....	92,983	.....	.....
To France.....	75,286	.....	.....
To Austria-Hungary.....	12,652	.....	.....
To Malta.....	4,298	.....	.....
To Belgium.....	3,175	.....	.....
To Spain.....	51,396	.....	.....
To Central and South America.....	56,551	.....	.....
To all other countries.....	29,147	.....	.....
Total.....	1,173,974	.....	.....

Value of franc and lira in United States currency, 19.3 cents.
There is a considerable interchange of silk (thrown and raw weaves), from Italy to France, Switzerland and Germany, to be dyed and finished and returned again.

The weaving of plain and figured silks is attributed to the Flemish, who settled in the country in the 16th century. The silk industry of England was greatly benefited by the revocation of the Edict of Nantes, it being estimated that 70,000 Huguenots, many of whom had been engaged in the fabrication of silks in France, sought refuge in England. There was a time, during the first half of the 19th century, when England gave every promise of becoming a very formidable rival of the silk industry in France. About 1800, the annual consumption of raw and thrown silk in England was given as 900,000 pounds, says an English writer in the 'National Review,' evidently thoroughly familiar with the facts he discusses. This quantity had increased in 1812 to 1,110,000 pounds; and by 1823 had doubled that amount. Coventry then had 7,000 working looms; Leek, 300 or 400; London, 24,000 hand looms; Macclesfield, 5,000; and Manchester probably 20,000. But internal dissensions began; disputes between weavers and masters were followed by strikes and consequent distress. The supply of silk goods was inadequate, and the demand led to wholesale smuggling. In 1826 the duties on raw and thrown silk were greatly reduced and

foreign silks were allowed to be imported at an ad valorem duty of 30 per cent. Affairs were more prosperous for awhile. The imports of raw silk rose steadily from 22,741 bales in 1830 to 112,757 bales in 1857. Meantime, in 1846, the duties on imported silk fabrics were still further reduced to 15 per cent, and the duties on raw and thrown silk were abolished. In 1852, agitation had begun for the repeal of the duties on French silks; and 27 of the silk firms of Manchester and the neighborhood memorialized the government to repeal "not partially and gradually" but "totally and immediately" the duties. Those manufacturers were prepared to meet the consequences whatever they might be; and they maintained that they were fully equal to the competition which would ensue. "Those 27 firms," the writer declares from whom these statements are taken, "have gone one and all out of existence, and from 1860, when the duties were wholly removed, the silk trade of England has suffered a painful decline. Instead of 24,000 looms in London there may be now (in 1894) 1,200; instead of 60,000 operatives, there are something under 4,000; and these figures express also the state of the trade at Manchester and Middleton combined. In 1845 there were

WORLD'S SILK INDUSTRY

850 looms in Derby; now there are 150. In 1860 there were 8,886 ribbon looms in Coventry; now there are less than 1,500. In 1851 the population of Coventry was 86,801; in 1881 it was 46,000. At Macclesfield from 1841 to 1851 there were 5,000 to 6,000 looms, which number in 30 years was reduced by one half. In Congleton in 1859 there were 40 silk throwsters, and now there are less than a dozen. This decline in manufactures is only too well corroborated by the decline in the imports of raw silk for manufacturing purposes.* The total valuation of the annual import of manufactured silk from European countries in 1853 was £2,000,000, and in 1854 £2,225,000, the supply being chiefly from France. After the duty was removed by the Cobden Free Trade Act of 1860 the import rose in 1861 to £6,000,000, and in 1863 to £6,639,115. Ten years later it stood at £10,065,378. In 1894 the total value of imported silk goods footed up to over £12,000,000. In 1899 it had reached £16,109,583. The Cobden Act dispersed the silk makers of England. Very many came to the United States. They came from Spitalfields, Coventry, Macclesfield, and Manchester. During 15 years the English manufacture sustained vigorously the struggle in spite of the constant encroachment of the importation. For France alone the importation of silks, which under the regime of prohibition was valued at 5,000,000 francs, and in 1832 represented 35,000,000, next attained more than 100,000,000. During the Franco-Prussian war in 1870 the English manufacturers made some slight headway, which was lost again in 1873. Although societies have been organized, technical schools opened, and all sorts of concerted efforts are still making to get back the lost industry, no headway has thus far been observed in undoing the damage inflicted by the free trade triumph. In 1902 England appears as the greatest consumer of French silks of any foreign country. The statistics of the industry are as follows:

GREAT BRITAIN.

Number of persons employed in the silk industry decennially, from 1851 to 1901.

Year	Males	Females	Total
1851	53,936	76,787	130,723
1861	43,732	72,588	116,320
1866	39,225	53,738	82,963
1871	22,205	42,630	64,835
1891	10,098	26,937	39,035

Silk dyers, machinists, and many others whose trade depends on silk are not included in these returns, or the numbers would be much larger.

GREAT BRITAIN.

Comparative table of Board of Trade returns for imports of raw, thrown and waste silk, and manufactured silk goods—1858-60 and 1900-3.

Imports		1858	1859	1860
Raw (lbs.)		6,277,576	9,030,891	9,176,647
Thrown (lbs.)		358,269	327,462	224,335
Waste (cwts.)		16,765	20,808	17,435
Goods (value)		£2,111,819	£2,655,357	£3,246,119

	1900	1901	1902	1903
Raw (lbs.)	1,413,320	1,322,840	1,252,848	†1,109,930
Thrown and spun	664,641	624,059	302,964	662,677
Waste (cwts.)	60,720	48,162	53,732	66,782
Goods (value)	£14,281,250	£12,030,321	£12,416,400	£12,663,771

*There were probably no imports of spun silk at this date.
†Lowest import of raw silk since 1816.

The annual production of silk goods in Great Britain now is estimated to be about £3,000,000 or \$15,000,000. To illustrate in part the exchange of silk fabrics between the principal silk manufacturing countries of the continent and England in 1900 the following tabulation is presented:

Great Britain, imports from	1900	Great Britain, exports to
115,111,000 fcs.	France	10,262,000 fcs.
48,426,162 fcs.	Switzerland	not known
41,127,000 fcs.	Germany	2,464,800
*26,989,620 fcs.	Italy	not known
231,653,782 fcs.		

*Value estimated. The reported quantity is 385,566 kilograms of fabrics.

The value of Great Britain's export of dutiable silks, chiefly spun silk, to the United States in 1900 was \$2,534,946, and in 1903 \$1,864,001.

Austria-Hungary.—Seven eighths of the silk produced in Austria is for home consumption. The production in 1900 was 80,000,000 kronen, the exports 9,892,000 kronen, and the imports 25,990,000 kronen. Value of krone in United States currency, 20.3 cents.

Russia possesses modern silk establishments at Moscow, and the annual output of the empire (in Europe) is about \$21,000,000 in value. A special feature is the weaving of gold and silver tissues, together with brocades, for sacerdotal use and for traffic with Central Asia.

Spain produces silk goods valued at \$4,000,000 on an average. The establishments are in Barcelona, Valencia, and Grenada.

Portugal, Belgium, and Sweden, each and severally, produce a few silk goods. The total values of their products present, however, no consideration of evident importance in the world's production.

Asia and the East.—Like much else in the region of the most remote civilization, silk fabrication is left to please the imagination with its history and its modern condition. With the Turk in particular, both in Europe and in Asia, the manufactured product of silk appears to be quite an unknown quantity. He uses most of it himself. His looms are primitive and the designs are very oriental. It is not easy to estimate the amount of silk goods produced. There are no statistics given under official authority which can be obtained. The annual imports of silk fabrics are about \$3,000,000. The domestic production is possibly one half that amount.

India.—The silk industry of India is known chiefly by the foulards, or corahs, sent to Eu-

WORLD'S SILK INDUSTRY

rope. Benares and its district form the most important centre of the manufacture, though silk is made in nearly all the provinces of India. The industry is largely for domestic consumption; and, it should be added, less goods are produced at a low price than formerly, because the population has adopted the use of cottons and woollens made in England. Silks have become more exclusively for the rich. The manufacture in India of silk mixed with other stuffs is said to be considerable.

In British India great attention has been given in recent years to raising native or Tussah silk. The most improved reeling processes and highly skilled reellers are employed, but the ex-

port output cuts no commercial figure of importance at this writing outside of about 600,000 pounds annually to England, France, and Italy.

China.—In all the villages of the great empire there are dense populations composed of artisans and agricultural laborers. With these the weaving of silk in the household has been practised from generation to generation. No official statistics are collected of their products. In 1883 it was estimated that the number of looms should be at least reckoned at 350,000, and the product at 300,000,000 francs, or \$60,000,000. The exports include taffetas, foulards, satins, serges, and crepes; but it was reported, after the sacking of the summer palace

JAPAN.

PRODUCTION, 1902	Kins	Pounds	Yens	Value in U. S. gold
Amount of production of raw silk.....	10,940,169	14,468,373	not given	not given
Amount of exported raw silk.....	8,697,706	11,302,716	74,667,331	\$ 37,184,330
Amount of production of Noshi waste, etc.....	4,446,781	5,880,867	.....	.....
Amount exported of Noshi waste, etc.....	4,789,287	6,333,832	4,468,769	2,225,526
Amount of production silk tissues 1902.....	.....	.....	76,941,003	38,316,619
Amount of production in four largest weaving districts.....	.....	.....	.....	.....
No. 1 Kyoto.....	.....	.....	19,034,985	9,479,422
No. 2 Fukui.....	.....	.....	14,629,427	7,265,454
No. 3 Guizma.....	.....	.....	8,068,741	4,018,296
No. 5 Ishikawa.....	.....	.....	5,640,997	2,808,768

The 18th statistical report published by the Department of Agriculture and Commerce of Japan, 1903. Value of yen in United States currency, 49.8 cents; kin, 1.3225 pounds.

EXPORTS—DESCRIPTION	Export of silk and silk tissues in years 1902-3			
	1902		1903	
	Yens	U. S. gold	Yens	U. S. gold
Raw silk up to 12 deniers.....	80,234,410	\$10,076,736	17,738,914	\$8,833,531
Raw silk over 12 deniers.....	51,636,045	25,715,049	48,042,613	23,925,231
Others.....	4,988,421	2,484,234	8,648,278	4,306,843
Silk Noshi waste.....	1,694,271	843,747	1,997,802	994,203
Other silk waste.....	4,019,524	2,001,723	4,993,669	2,486,847
Total silk materials.....	82,572,271	\$41,221,489	81,420,276	\$40,347,367
Silk tissues (silk crepes).....	41,160	\$20,498	156,908	\$78,147
Silk tissues, habutse, plain.....	23,462,664	11,684,406	24,886,460	12,393,458
Silk tissues, habutse, figured.....	1,422,742	608,925	2,624,017	1,306,760
Silk tissues, Kaki.....	2,672,827	1,331,100	1,000,386	498,192
Silk tissues, others.....	478,686	238,386	423,743	211,024
Silk tissues, handkerchiefs.....	3,154,236	1,576,809	2,932,420	1,463,333
Silk tissues, embroidered.....	73,825	36,799	82,398	41,034
All others.....	274,560	136,730	168,665	83,993
Total silk piece goods.....	31,380,830	\$15,627,653	32,281,011	\$16,073,943
Total exports.....	113,953,101	\$56,749,142	113,701,287	\$56,421,310

The Foreign Trade of Japan, published by the Department of Finance of Japan, 1904.

IMPORTS—DESCRIPTION	Imports of silk and silk tissues in years 1902 and 1903.			
	1902		1903	
	Yens	U. S. gold	Yens	U. S. gold
Cocoons.....	546,165	\$272,090	927,018	\$461,655
Raw silk.....	1,382	688	6,778	3,375
Tussah silk yarn.....	955,275	473,727	596,725	297,169
Silk yarns.....	7,109	3,540	3,934	1,961
Total silk materials.....	1,510,131	\$752,045	1,533,455	\$763,660
Pongees.....	84,187	\$41,925	45,360	\$22,589
Satins.....	37,529	18,689	19,936	9,920
Silk faced cotton satins.....	222,311	60,911	36,407	18,131
Plush and velvet, silk and cotton.....	631,233	314,354	265,272	132,153
All other silk tissues.....	71,582	35,648	40,660	19,930
Total silk piece goods.....	946,842	\$471,527	407,135	\$202,753
Total imports.....	2,456,973	\$1,223,572	1,940,590	\$966,413

WORM-EATING WARBLER—WORMELEY

of the emperor during the war in 1894, that the Chinese manufacture of silks and velvets was displayed in a way not familiar to the European. The best of everything had been retained within the empire. It was estimated in 1902, that the Chinese silk industry consumes annually about 18,600,000 pounds of raw silk, or say 55 per cent of the estimated production by China. This estimate would indicate a probable annual value of production of silk stuffs in China of \$70,000,000 or upward.

Japan.—In Japan silk factories are established in many provinces. The greatest number are in Kioto, in the province of Yamashiro, notable for taffetas, brocades, and crepes. Next in rank is Kiriu in the province of Joshu, Gunma prefecture. Published statistics in 1900 stated that there were 382,000 hand looms employed in the several textile industries in Japan. Among these, though details are not given, it was estimated the silk looms numbered 40,000. Half of the output was attributed to Kioto, and one quarter to Kiriu. Like Italy, Japan devotes more attention to raising silk than to manufacturing the raw product. In December 1902 an estimate placed the production of Japan at 16,093,580 pounds, and the domestic consumption at 6,613,800 pounds, or say 41 per cent of the production. According to the returns of the Department of Agriculture and Commerce of Japan in 1903, the raw silk production of Japan in 1902 was 10,940,169 kin (1,3225 pounds), say 14,468,373 pounds. The amount reported as exported was 8,697,706 kin, showing a domestic consumption of say 3,000,000 pounds in that year. Undoubtedly there is a considerable quantity of waste silk entering into the production of silk tissues in Japan, for the reported production of silk tissues in 1902 amounts to 76,941,003 yen, say \$38,316,619. The output of production of silk tissues in the four largest weaving dis-

tricts amounted in 1902 to \$23,591,880. The exports of silk tissues in the same year amounted to \$15,627,653. We must therefore conclude that the reported production of raw silk, and of noshi waste, etc., are understated in the accompanying official reports, for the reason that the actual production is beyond the reach of the statistical authorities of Japan. The latest returns regarding the silk trade of Japan, production, exports, and imports, are appended.

See SILK, MANUFACTURE OF.

FRANKLIN ALLEN, C. P. A.,
Secretary Silk Association of America.

Worm-eating Warbler, a small, ground-keeping warbler (q.v.) of the United States (*Helmitheros vermivorus*), breeding commonly in the woods of the eastern part, and migrating in winter to Central America. It is $5\frac{1}{2}$ inches long, olive-green above, yellowish-white below, the distinguishing specific mark being three black stripes on the buffy crown. Its song is a faint thrill, heard most often in hilly woodlands, where the bird hunts for caterpillars and similar food among the lower branches of the bushes or upon the ground. Its nest is constructed with great skill in some little natural cavity of a hillside, and is cleverly hidden under an arch of twigs and old leaves, so disposed as to well conceal the white, red-speckled eggs. The mother uses the trick common to so many ground-building birds, of feigning lameness, fluttering ahead of the intruder in a frantic attempt to draw him away from the nesting-place in vain pursuit of herself.

Worm-seed, the flower-heads of certain species of *Artemisia* (q.v.) used as a vermifuge. See also ERYSIMUM; GOOSEFOOT.

Worm-shell, one of the curiously uncoiled and distorted gastropod mollusks of the marine family *Vermetidae*, whose shells might easily be mistaken for the tubes of annelids, such as *Serpula*. They are free and spiral in early life, and crawl about like ordinary gastropods, but they afterward settle down and become attached to stones, etc., for the remainder of their lives. The animals are worm-like, with a short proboscis, horny jaws and radula, and two short tentacles. When they become stationary the foot, being of no further use as a locomotive organ, becomes modified into an organ of attachment, and the shell stretches out irregularly. The species are not numerous and occur mainly within the tropics.

Wormeley, werm'li, Katharine Prescott, American author and translator; b. Ipswich, England, 14 Jan. 1830; d. 4 Aug. 1908. She was the daughter of an English rear admiral and a niece of Commodore Edward Preble of the American navy, and came to the United States in girlhood. She was engaged in the relief of Union soldiers during the Civil War and was connected with the United States Sanitary Commission. She was widely known as a translator of Honoré de Balzac's novels in 40 volumes (1883-97); of Molière in 6 vols. (1892); and of the Duc de Saint-Simon's 'Memoirs' (1898-1901); and wrote 'Letters from Headquarters during the Peninsular Campaign' (1862); 'The Other Side of War' (1888); 'Life of Balzac'; 'The United States Sanitary Commis'n' (1863).

SUMMARY OF WORLD'S PRODUCTION AND CONSUMPTION OF RAW SILK FOR THE YEAR 1902:

COUNTRIES	Production Pounds	Consumption Pounds
Europe —France	1,543,220	8,618,400
Italy	9,726,695	2,204,600
Switzerland	110,230	3,417,130
Spain	180,777	440,900
Austria	449,736	1,598,335
Hungary	233,529	.....
Russia and Caucasia	881,840	3,086,440
Bulgaria, Servia, Rumania	194,005	.....
Greece and Crete	133,276	33,069
Salonica, Adriatic	440,920	.....
Germany .....	.....	6,172,880
England .....	.....	1,763,680
Asia —United States .....	.....	10,802,540
Brutia	881,840	110,230
Byria	992,070	220,460
Persia	727,518	363,739
Turkestan	1,807,772	1,543,220
China	24,867,888	14,186,601
China, Canton	8,818,400	4,409,200
Japan	16,093,580	6,613,800
India	2,645,320	3,086,440
Tongkin and Annam	2,204,600	1,984,140
Africa —Egypt .....	.....	396,828
Tripoli and Morocco .....	.....	220,460
Algeria and Tunis .....	.....	165,345
Other countries and balance. .....	.....	1,313,941
Total	78,932,418	72,952,418

W. B.—Chinese Tussah silks are included.

WORMS—WORT

Worms, vörms, Germany, a town of Hesse-Darmstadt, on the Rhine, nine miles northwest of Mannheim. The town is irregularly built and has remains of its mediæval walls and ramparts. Its principal building is the cathedral, completed and consecrated in 1101, a noble Romanesque structure with four elegant towers, two domes, a double choir, and a flamboyant 15th century Gothic portal. The interior is 357 feet long, 87 feet wide, across the transepts 117 feet, and is very imposing from its grand simplicity. On the north side of the cathedral is the site of the Bischofshof or episcopal palace, the seat of the celebrated Diet of Worms in April 1521. It was destroyed by the French in 1689, and again in 1794. On its massive red sandstone substructure the Heil'sche Haus has been erected in the rich Renaissance style. The restored church of Saint Martin, and the Church of Saint Paul secularized as a museum, are also of notable ecclesiastical architecture. Outside the town stands the Liebfrauenkirche (dating from the 15th century), which gives its name to the Liebfrauenmilch, a much-esteemed wine grown in the vicinity. The finest monument in Worms is that to Luther, erected from Rietschel's designs in 1868 at a cost of \$85,000. Worms is a considerable river port with a good harbor and an active shipping trade. The principal industries of Worms are the manufacture of patent leather, tobacco, beer, soap, and amber wares. Worms is one of the most historical towns of Germany. It was known to the Romans as Borbetomagus, and later as Augusta Vangionum, the capital of the Vangiones. It was destroyed by Attila and rebuilt by Chlodwig in 486. After the partition of the empire among the sons of Ludwig the Pious, Worms became a German free town under the protection of the Elector of the Palatinate. Already in 1255 it belonged to the Confederation of Rhenish towns, and it contained in the time of Frederick Barbarossa 70,000 inhabitants. It was the seat of many Imperial Diets, most famous that under Karl V., which Luther made memorable to the world. In 1632 the suburbs of the town were leveled by the Swedish Colonel Haubold, and in 1689 the town itself was ruthlessly destroyed by Melac and the young Duc de Créquy under the orders of Louis XIV. In September 1792 part of it was leveled by the French under Custine; at the peace of Lunéville in 1801 it was given to France. The peace of Paris in 1814 gave it back to Germany, and the Vienna Congress in 1815 to Hesse-Darmstadt.

Worms, any of many elongated jointed animals; the term has no more definite signification or limits than has Vermes (q.v.). Examples of what may most properly be called worms are earthworms, leeches, marine annelids, and the parasitic flatworms, roundworms, etc., especially such as infest the intestinal tract. These are described elsewhere, under their names. See also PARASITES.

Worm'wood, a perennial herb (*Artemisia absinthium*) of the order Compositæ. It is a native of Europe and northern Asia, whence it has been introduced into other countries by way of gardens in which it was formerly cultivated for domestic medicine. The plant grows about three feet tall, is spreading, bears silky, pinnatifid leaves and yellow flowers in heads

arranged in racemes. All parts of the plant are intensely bitter, on which account they, the leaves especially, have been used for flavoring drinks. Wormwood is cultivated to some extent for the manufacture of absinthe (q.v.), of which it forms one of the most important ingredients and which is named from it. See ARTEMISIA.

Wor'num, Ralph Nicholson, English art critic: b. Thornton, Northumberland, 29 Dec. 1812; d. Hampstead, Middlesex, 15 Sept. 1877. He was educated at University College, London, and between 1834 and 1839 studied painting and the fine arts in the principal continental cities. Having practised portrait painting for some years in London, he devoted himself principally to the literature of his profession. In 1848 was appointed lecturer on ornamental art in the government schools of design, and in 1852 librarian and keeper of casts in the department of art into which they were constituted. In 1855 he was made keeper and secretary of the National Gallery. He published 'History of Painting, Ancient and Modern' (1847); 'Epochs of Painting' (1860); 'Analysis of Ornament' (1856); 'Life and Works of Hans Holbein' (1867).

Woronsoff, vör'ön-zof, Michael Semenovitch, PRINCE, Russian statesman and general: b. Moscow 17 May 1782; d. Odessa 18 Nov. 1856. He was educated in England, where his father was Russian ambassador, entered the Russian army in 1801, served against the Turks, and distinguished himself in the war with France. He was severely wounded at Borodino and commanded the cavalry at the battle of Leipzig in October 1813. Ten years later he was named governor of New Russia and Bessarabia, and in 1844 governor of the Caucasus. He carried on the war with the mountain tribes, and took Shamyl's stronghold, Dargo, 18 July 1845.

Worship, the act of paying divine honors to the Supreme Being; or the reverence or homage paid to Him in religious exercises, consisting in adoration, confession, prayer, thanksgiving, and the like. The homage paid to idols or false gods by pagans; idolatry of inferiors. Obsequious or submissive respect; unbounded admiration; as, hero worship. Also a title used in Great Britain and some British colonies in addressing certain magistrates. See RELIGION.

Worsted, wust'éd or wúr'stéd, are varieties of woolen yarn or thread, spun from long-staple wool which has been combed, and which in the spinning is twisted harder than ordinary. It is knit or woven into stockings, carpets, etc. The name is derived from Worsted, a village in Norfolk, where it is supposed to have been first manufactured. See TEXTILE INDUSTRIES, AMERICAN.

Wort, the saccharine liquid obtained by the action of malt on a mixture of water and crushed barley, corn, or other grain, the whole being known as the "mash." The water extracts the maltose and dextrine from the malt and allows the diastase to act on the starch of the grain, changing it also to maltose and dextrine. The pectase of the malt at the same time changes the grain proteids to soluble peptones. Care must be taken of the temperature and the dilution of the mash in order to obtain the best results. Worts are of various kinds, depending

WORTH—WOTTON

on the grain used and the temperature given it. Some are fermented to beer, ale, porter, and like beverages, while other forms are fermented to a mash that is distilled for alcohol or whiskey.

Worth, wérth, Charles Frederick, Anglo-French dressmaker: b. Bourne, Lincolnshire, England, 1825; d. Paris 11 March 1895. Removing to Paris in 1846, he started there an establishment for the making of fashionable costumes. He was eminently successful as a designer and his establishment in the Rue de la Paix became the leading emporium of fashion for Europe and the United States, employing 1,200 persons.

Worth, William Jenkins, American general: b. Hudson County, N. Y., 1 March 1794; d. San Antonio, Texas, 7 May 1849. He received an ordinary education, and when the War of 1812 broke out enlisted as a private soldier, rising to the rank of captain in 1815. He was instructor of infantry tactics and commander of cadets at West Point 1820-8 and in 1838 became colonel of the 8th infantry. In 1840 he was sent to serve in the war against the Florida Indians, and in 1841 took the chief command. He was successful in repeated and severe conflicts with the savages, whereby the war was brought to a close, and in August 1842 was brevetted a brigadier-general for gallantry and distinguished services. In the war with Mexico, at the battle of Monterey 23 Sept. 1846, he bore a very important part. As it was impossible to communicate with the commander-in-chief, Worth was obliged to act independently throughout the battle. He carried the forts commanding his line of approach, stormed the bishop's palace, and had fought his way through the streets nearly to the great plaza, when the town capitulated to Taylor, approaching from the other side. For these achievements Worth was brevetted a major-general, and received a sword from Congress. He was also distinguished at Cerro Gordo, Puebla, Churubusco, Molino del Rey, and at the storming of the City of Mexico. A monument was erected to his memory by the city of New York, at the junction of 5th Avenue and Broadway, where his remains are interred.

Worth, William Scott, American general: b. Albany, N. Y., 6 Jan. 1840; d. Clifton, S. I., 16 Oct. 1904. Entering the Union army as 2d lieutenant in 1861, he became captain in 1866; lieutenant-colonel of the 13th infantry in 1894, and colonel in September 1898. He accompanied the army to Cuba, and during the assault on San Juan Hill, 1 July 1898, was severely wounded. He was promoted brigadier-general, U. S. A., in the following November, and was retired a week later.

Wörth, wért, Germany, a village in Alsace, at the confluence of the Sauerbach and Sulzbach rivers, 10 miles southwest of Weissenburg. It is celebrated as the place where the French on 6 Aug. 1870 met their first great defeat in the Franco-German war (q.v.).

Worthen, wér'then, William Ezra, American civil engineer: b. Amesbury, Mass., 14 March 1819; d. New York 2 April 1897. After graduation from Harvard in 1838, he began the practice of civil engineering, and until 1848 was employed chiefly with surveys connected with the Boston water-supply, and in other hydraulic works. He designed and constructed several

mills in Lowell, in 1849 began architectural work in New York, was made engineer of the New York & New Haven railway, and in 1854 its vice-president. After 1854 he was busily employed as a practising and consulting engineer, being frequently retained as an expert in matters relating to the planning, construction, or improvement of sewage and water systems. He was chief engineer of the first rapid transit commission of New York, and in 1890-1 chief engineer of the Chicago main drainage canal. In 1887 he was president of the American Society of Civil Engineers. Besides official reports, he published: 'Cyclopædia of Drawing' (1857); 'First Lessons in Mechanics' (1862); and 'Rudimentary Drawing for Schools' (1863).

Worthing, wér'thing, England, a watering-place in Sussex, 12 miles west of Brighton; with good streets, handsome terraces, crescents, and villas, splendid hotels, baths, smooth sands, a beautiful esplanade, libraries, a literary institution, reading-rooms, and assembly-rooms. Fruit-growing is an important industry of the town.

Worthington, wér'thing tón, George, American Protestant Episcopal bishop: b. Lenox, Mass., 14 Oct. 1840; d. Mentone, Fr. 7 June 1908. He was graduated from Hobart College in 1860 and from the General Theological Seminary in 1863. He was rector of St. John's Church, Detroit, 1868-85, and was consecrated bishop of Nebraska in 1885.

Worthington, Henry Rosalter, American inventor: b. New York 17 Dec. 1817; d. Tarrytown, N. Y., 17 Dec. 1880. In 1840 he began a series of experiments with steam for the propulsion of canal boats, soon afterward devised a small steam pump to be used in the maintenance of the water supply in the engine boiler, and in 1841 patented an independent feed pump which developed into the direct-acting steam pump that he patented in 1849. Subsequently he built in Savannah, Ga., the first direct-acting compound-engine ever used in waterworks; invented the duplex pump, and devised various improvements in steam and hydraulic machinery.

Worthington, Minn., village, county-seat of Nobles County; on the Burlington, C. R. & N. and the Chicago, M., St. P. & O. R.R.'s; nearly 100 miles northeast of Sioux City, Ia. It is in an agricultural section. It has flour mills, grain elevator, stock-yards, and machine shops. The three banks have a combined capital of \$125,000. The village has a high school established in 1883, and a public library. Pop. (1910) 2,385.

Wotton, wót'ón, Sir Henry, English diplomat and poet: b. Boughton Malherbe, Kent, 30 March 1568; d. Eton December 1639. He was educated at Oxford, and having studied civil law under an eminent Italian professor, became proficient in the Italian language. He visited all the principal countries of the Continent 1589-97, and on his return was secretary to the Earl of Essex. On the fall of that nobleman he went to Florence, where he composed a treatise, printed after his death, entitled 'The State of Christendom'. The Grand Duke of Tuscany having intercepted some letters disclosing a plot to take away the life of James, king of Scotland, engaged Wotton to carry secret intelligence of it to that prince. This service he ably per-

WOUFFE'S BOTTLE—WOUND

formed in the character of an Italian, and when James came to the English crown he sent for Wotton, knighted him, and in 1604 employed him as an ambassador to the Republic of Venice. As Wotton passed through Augsburg, being desired to write in an album, he wrote in Latin that "an ambassador is a good man, sent to lie abroad for the good of his country." This innocent sally was represented as a state maxim sanctioned by the religion of the king of England. James, who thought nothing relative either to king-craft or state-craft a subject for wit, was highly displeased; and on his return Wotton had to make humble apology. At length he recovered the royal favor, and was restored to his former post at Venice (1616-19). Other missions followed, and in 1624 he was made provost of Eton College. The first-fruits of his leisure were his 'Elements of Architecture.' A collection of miscellanies was published after his death entitled 'Reliquie Wottonianæ.' This collection includes several poems by Wotton, of which two, 'The Character of a Happy Life' and 'On His Mistress, the Queen of Bohemia,' are among the finest lyrics in the English language. Consult 'Lives' by Isaac Walton (1651) and A. W. Ward (1899).

Woulfe's Bottle, in chemistry, a bottle devised by a London chemist, Peter Woulfe (1806). It has two or more separate necks and is used by chemists when it is necessary to have more than one glass tube leading into or from the bottle.

Wound, in surgery, a solution of continuity of any tissue or soft part of the body. Wounds are divided by writers on surgery into several kinds, the distinctions being founded either upon the sort of weapon with which the injury has been inflicted; upon the circumstance of a venomous matter having been introduced into the part; or upon the nature of the wounded parts themselves, and the particular situation of the wound. Hence we have cuts, incisions, or incised wounds, which are produced by sharp-edged instruments, and are generally free from all contusion and laceration. The fibres and texture of the wounded part have suffered no other injury but their mere division; and there is, consequently, less tendency to inflammation, suppurating, gangrene, and other bad consequences than in the generality of other species of wounds. Another class of wounds are stabs, or punctured wounds, made by the thrusts of pointed weapons, as bayonets, lances, swords, daggers, etc., and also by the accidental and forcible introduction of considerable thorns, nails, etc., into the flesh. These wounds frequently penetrate to a great depth so as to injure large blood-vessels, viscera, and other organs of importance; and as they are generally inflicted with much violence the parts suffer more injury than what would result from their simple division. Many instruments by which punctured wounds are made increase in diameter from the point, and when they penetrate far they force the fibres asunder like a wedge, and cause serious stretching and contusion. Bayonet wounds of the very soft parts are ordinarily followed by violent inflammation, tumefaction, large abscesses, fever, delirium, etc. A third description of wounds are the contused and lacerated, which strictly comprehend, together with a variety of cases produced by the violent

application of hard, blunt, obtuse bodies to the soft parts, all those common injuries called gunshot wounds (q.v.). Many bites rank also as contused and lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon which has neither a sharp point nor edge must be a contused, lacerated wound.

Poisoned wounds are those which are complicated with the introduction of a venomous matter or fluid into the part. Such are the stings and bites of a variety of insects, and the surgeon, in the dissection of putrid bodies, or in handling instruments infected with any venomous matter, is exposed to the danger of poisoned wounds from cuts. The most dangerous, however, of this class of wounds occur from the bites of the viper, the rattlesnake, etc., or from those of rabid animals. (See *HYDROPHOBIA*.) Wounds may likewise be universally referred to two other general classes, the simple and complicated. A wound is called simple when it occurs in a healthy subject, has been produced by a clean, sharp-edged instrument, and is unattended with any serious symptoms. A wound, on the contrary, is said to be complicated when the state of the system, of the wounded part, or the wound itself, indicates the necessity for more complex treatment than the simple reunion of the cut surfaces. The differences of complicated wounds must therefore be very numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage, nervous symptoms, contusion, the unfavorable shape of the injury, the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels, etc. All large or deep wounds are attended with more or less of symptomatic fever, which usually comes on at a period varying from 16 to 36 hours after the infliction of the injury, and is generally of the inflammatory, but sometimes of an asthenic character. The liability to gangrene is also a formidable danger to be guarded against in the treatment of complex wounds.

In incised wounds the first thing to be attended to is to stop the hemorrhage. This is usually accomplished by simply bringing the edges of the wound together; but if any of the larger blood-vessels have been injured, pressing the trunk by means of a bandage or tourniquet will be necessary; and should this not succeed, the vessels must be secured with ligatures. Next, care should be taken that all extraneous substances are removed from the wound. Then the edges of the wound are to be brought together, and retained either by straps of adhesive plaster, or in some situations by one or two stitches. Generally such wounds heal very quickly, without any suppurating, "by first intention." When, however, this is not the case, and suppurating comes on, all attempts to procure union by first intention should be abandoned, the plasters and bandages removed, poultices and warm dressings used to remove inflammation, and afterward healing ointment applied. Lacerated and contused wounds require to be similarly treated; but they heal less kindly, and suppurating almost always takes place. The swelling and inflammatory symptoms which commonly attend contused wounds are to be diminished by cooling lotions or emollient poultices. Punctured wounds are dangerous from their depth;

WOUWERMAN — WRANGEL

and the internal effusion of serum and blood which usually attends them. They are frequently also followed by severe inflammation and suppuration. The same general principles apply in this case, too. Sometimes it may be necessary to enlarge the wound a little, so as to remove the stretching of the parts, and to lessen the inflammation; leeches and fomentations are often required. In poisoned wounds free incisions, and even amputation may often be necessary.

Wouwerman, wow'vër-măn, Philips, a Dutch painter: b. Haarlem 1620; d. there 19 May 1668. He was instructed by his father, an indifferent artist, and by Wynants of Haarlem, in which city his life was passed. According to the commonly received account, his reputation as a painter during his life was small. After his death his pictures rose immensely in value, and he is now one of the most esteemed painters of the Dutch school. In consequence, it is said, of the disgust with which this neglect inspired him, he destroyed before his death all the studies he had made during his life, from fear that his son might be induced by the possession of them to become a painter. His subjects consist for the most part of roadside scenes and hunting or battle pieces, and it is commonly believed that he never painted a picture without a white or gray horse as a conspicuous object. His technical qualities are of a high order, and his skies, foregrounds, and foliage are executed in the best style of his school. He left upward of 800 carefully finished pictures. Those offered for sale always fetch high prices, and in 1892 his 'Halt of a Sporting Party' was sold for \$18,375. The best collection of his works is in the Royal Gallery of Dresden. There are also fine examples in the Louvre, and in Munich, Vienna, St. Petersburg, Amsterdam, The Hague, Rotterdam, etc.

Wrack, or **Sea-wrack**, a name applied to sea-weeds of various species, which, having been uprooted during storms, are carried to shore and there left by the tide. Wrack, when reduced to ashes, furnishes an alkali known as kelp, employed in the manufacture of glass and soap; it is now, however, little used for that purpose, having been supplanted by barilla (q.v.). The alkali of sea-weeds supplies the chemical substance iodine (q.v.). The salt contained in wrack makes it of value as a fertilizer, and it is largely gathered as such in some agricultural districts. From portions of the Japanese coast it is exported to the interior of China, where salt is not abundant.

Wrangel, vräng'ël, or **Wrangell**, Ferdinand Petrovitch, Baron, Russian naval officer and explorer: b. Livonia 9 Jan. 1795; d. Dorpat 6 June 1870. He studied at the Naval Academy, St. Petersburg, and in 1820-4 directed a Polar expedition to explore the coast of eastern Siberia and the region north of Asiatic Russia. By sledge-journeys undertaken in 1822 and 1823 he reached lat. 72° 3' N., but he found no trace of the reported land for which he was searching. This was discovered by G. W. De Long (q.v.) in 1867, and is now known as Wrangel Land (q.v.), though taken possession of for the United States as "New Columbia" by Hooper in 1881. In 1829-34 Wrangel was governor-general of Russian America, and in 1840-9 director of the Russian-American Company. He

attained vice-admiral's rank in the navy. In 1855-8 he was acting minister of marine, and subsequently a councillor of state. He opposed the sale of Russian America to the United States. His account of his Polar expedition appeared in Russian in 1841. An account in German was prepared from Wrangel's journals (1839), and of this an English translation was made by Sabine, 'Wrangell's Expedition to the Polar Sea' (1840). Consult Von Engelhardt, 'Ferdinand von Wrangel und seine Reise' (1885).

Wrangel, Friedrich Heinrich Ernst, Count, German soldier: b. Stettin 13 April 1784; d. Berlin 1 Nov. 1877. He became ensign in a Prussian regiment of dragoons in 1796, took part in the campaigns of defense against Napoleon, and rose to be successively colonel (1815), major-general (1823), and lieutenant-general (1838). At the outbreak of the war of 1848-50 with Denmark he was made general of cavalry and commander of the allied forces in Schleswig-Holstein. Victorious at Schleswig (23 April 1848), he entered Jutland, but withdrew in September from the chief command, and later quelled the insurrection in Berlin. In 1856 he was promoted field-marshal. He was appointed generalissimo in the war of 1864 with Denmark, but retired after the storming of the lines of Düppel (18 April).

Wrangel, Karl Gustaf von, Count, Swedish general: b. Skokloster, on Lake Maelar, 13 Dec. 1613; d. Isle of Rugen 24 June 1675. He accompanied Gustavus Adolphus in his expedition to Germany, and at the battle of Lützen, in 1632, rendered great services after the fall of the king. In 1641 he was one of the major-generals who commanded the Swedish forces until the arrival of Torstenson, and under him participated in the campaign in Germany, and the famous march to Holstein. After the death of Flemming in 1644 he received the supreme command of the Swedish fleet, and obtained over the Danish fleet a great naval victory on 13 October, between the islands of Femern and Laaland. In 1646 he succeeded Torstenson as commander-in-chief of the Swedish army, effected a junction at Giessen with the French forces under Turenne, with whom he crossed the Main and besieged Augsburg, which, however, was relieved by the Austrian army. In 1648 the Swedes and French defeated the Austrians and Bavarians near Zusmarshausen, but retired before the army of Piccolomini. Wrangel commanded under Charles X. in the campaigns in Poland (1655) and Denmark (1657-9), and in 1674 led an army of 16,000 men into the electorate of Brandenburg.

Wrangel (räng'gël) Land, or **New Columbia**, an island in lat. 71° N., and lon. 180° W.; in the Arctic Ocean; about 100 miles off the coast of Siberia and 300 miles from the coast of Alaska. It is about 75 miles long and 20 miles wide. It consists chiefly of bare rocks which rise to a height of 2,000 feet. At the base and in places near the shore line there is some vegetation. The first mention of an island in this locality was made about 1810, and in 1821 Ferdinand Baron Wrangel (q.v.), the Russian explorer, commanded an expedition in search of this land. Long, the American explorer, sighted the island in 1867, and Hooper, also an American, visited it in 1881, and took posses-

sion of it for the United States. He named the island New Columbia.

Wrangell, Alaska, village, on Wrangell Island, near the mouth of the Stikine River; about 170 miles southeast of Juneau, and 120 southeast of Sitka. A settlement was made here by Russians in 1833. It is a trading post for fish and furs. It has a hatchery, salmon canneries, and storehouses. It is a distributing centre for mining camps and interior trading post. Pop. about 900.

Wrangler, Senior, a term applied in the University of Cambridge, England, to the undergraduate who passes the best public mathematical examination for the bachelor's degree. The candidates for honors are arranged in order of merit in three lists or classes, of which the highest is called that of wranglers, the next that of senior optimes, and the lowest that of junior optimes—the whole constituting what is known as the mathematical tripos. Hence the senior wrangler, or the highest in the list of wranglers, is the most distinguished mathematician of the year.

Wrasse, a fish of the family *Labridæ* (q.v.).

Wrattislaw, rät's-lā, Arthur Henry, English scholar: b. England of Bohemian parentage about 1822; d. 1892. He was graduated from Cambridge in 1844, was headmaster of Felstead grammar school 1849-57, and of that at Bury St. Edmunds 1857-79, and was vicar of Manorbier, Pembrokeshire, Wales, 1879-87. He was the leading Slavonic scholar of his day in England, and among the important of his publications are: 'Lyro Czecho-Slavonska' (1849); 'The Queen's Court MSS. with Other Ancient Bohemian Poems' (1852); 'Life, Legend, and Canonization of St. John Nepomuk' (1873); 'Native Literature of Bohemia in the 14th Century' (1878); 'Sixty Folk Tales from Slavonic Sources' (1889).

Wraxall, rāk'sal, Sir Nathaniel William, English historian: b. Bristol 8 April 1751; d. Dover, Kent, 7 Nov. 1831. He was in the East Indian Civil Service 1769-72, and during the course of some seven years of foreign travel was a confidential agent of Queen Caroline Matilda of Denmark to her brother George III. (1774-5). He published 'Cursory Remarks Made in a Tour' (1775); 'Memoirs of the Valois Kings' (1777); 'History of France from Henry III. to Louis XIV.' (1795); 'Memoirs of the Courts of Berlin, Dresden, Warsaw, and Vienna' (1799), and the famous 'Historical Memoirs of My Own Time, from 1772 to 1784' (1815). For a libel in the last on Count Woronzov, Russian envoy to England, Wraxall was fined \$2,500 and sentenced to six months' imprisonment. He is an amusing writer, but his veracity has been many times questioned. He sat in Parliament for 14 years from 1780 and was knighted in 1813. Consult his 'Posthumous Memoirs,' continued from 1784 to 1790 (1836).

Wray, John. See RAY, JOHN.

Wreck, the destruction of a ship by being driven ashore, dashed against rocks, foundered by stress of weather, or the like; shipwreck (q.v.).

Wreck of the Grosvenor, The, a story by William Clark Russell, published in 1874. This tale of the British merchant marine is notable among sea novels for its fidelity to the life por-

trayed. The chief value of the book lies in its dealing in a plain, straightforward manner, and without exaggeration, with some of the most glaring evils of the mercantile marine. Events like those recorded in its pages are familiar to every man who sailed the seas during the middle and even the latter part of the 19th century, and they show to what an extent the power given by the law may be abused when placed in the hands of ignorant and brutal officers. 'The Wreck of the Grosvenor' is said to have been a powerful factor in reforming the laws relating to the merchant seamen in Great Britain.

Wreckage, in navigation, is usually understood to mean any ship or goods driven ashore or found floating at sea in a deserted or unmanageable condition. In law, wreckage is defined as such articles of value as are cast upon land by the sea, and includes jetsam, flotsam, ligan, and derelict. In most countries any person found stealing or destroying any wreck is chargeable with felony; and a person proved to be in possession of shipwrecked goods, or who offers such goods for sale, may be fined or imprisoned.

Wrede, vrä'dé, Karl Philipp, Prince, Bavarian field-marshal: b. Heidelberg 29 April 1767; d. Ellingen, Bavaria, 12 Dec. 1838. He was educated at the University of Heidelberg in his 25th year, became assessor to the high court of Heidelberg, and on the outbreak of war between France and Austria civil commissary for the palatinate in the Austrian army. He not only discharged the functions of this office for five years, but took part in the military operations, and in 1795 became a colonel. On 3 Dec. 1800 he was engaged in the battle of Hohenlinden, where he had the rank of major-general, and after the battle covered the retreat of the defeated Austrian army. He was appointed to the chief command of all the Bavarian forces in the field in 1805, and in the campaign of that year, owing to the Franco-Bavarian alliance, fought on the side of his former foes. He participated in the battle of Wagram (6 July 1809), his services on this occasion being rewarded with the grade of field-marshal and the title of count. In 1812 he accompanied Napoleon in his fatal Russian campaign as commander of the Bavarian cavalry, and in October 1813, after Bavaria had been detached from the French alliance, at the head of 170,000 men, attempted to cut off the retreat of Napoleon, who had been defeated at Leipsic, but was defeated at Hanau. In 1816 he was created a prince, and the estate of Ellingen conferred upon him.

Wren, rēn, Sir Christopher, English architect: b. East Knoyle, Wiltshire, 20 Oct. 1632; d. Hampton Court, Berkshire, 25 Feb. 1723. He entered as a student at Wadham College, Oxford, in 1646, having previously given proofs of genius by the invention of astronomical and pneumatic instruments. In 1647 he wrote a treatise on spherical trigonometry upon a new plan, and the following year composed an algebraical tract on the Julian period. He was one of the earliest members of the Philosophical Society at Oxford, which was the origin of the Royal Society, after the institution of which, in 1663, he was elected a fellow, and distinguished himself by his activity in promoting the

objects of that institution. In 1657 he was appointed professor of astronomy at Gresham College, but, being nominated to the Savilian professorship of astronomy at Oxford, resigned the former office, and in 1661 returned to the university. He received a commission, in 1663, to prepare designs for the restoration of St. Paul's Cathedral, then the largest Gothic edifice in the kingdom. While his designs were under consideration the cathedral was destroyed by the fire of 1666, and Wren had now an opportunity for signalizing his talents by the erection of an entirely new structure. In 1668 he succeeded to the office of surveyor of works, resigned his Savilian professorship in 1673, in 1674 received the honor of knighthood; and in the following year the foundation of the new cathedral was laid. In 1680 he was chosen president of the Royal Society. In 1683 he was appointed architect and one of the commissioners of Chelsea College; and the following year controller of the works at Windsor Castle. He was elected member of Parliament for Plympton in 1685, and to his public trusts were added, in 1698, that of commissioner for the repair of Westminster Abbey, and, in 1699, that of architect of Greenwich Hospital. In 1700 he represented in Parliament the boroughs of Weymouth and Melcombe Regis. In 1708 he was made one of the commissioners for the erection of 50 new churches in and near the city of London. After having long been the highest ornament of his profession he was, in 1714, deprived of the surveyorship of the royal works from political motives. He was then in the 85th year of his life, the remainder of which was devoted to scientific pursuits and the study of the Scriptures. His remains were interred under the choir of St. Paul's Cathedral; and over the choir entrance was placed the following inscription (since removed to another part of the church):

Subtus conditor
Hujus Ecclesiae et Urbis Conditor,
Christ. Wren;
Qui vixit Annos ultra nonaginta,
Non sibi sed Remo publico.
Lector, si Monumentum quaeris,
Circumspice.

(Beneath is laid the builder of this church and city, who lived above ninety years, not for himself but for the public good. Reader, if thou seekest his monument, look around.)

The edifices constructed by Wren were principally public, including a royal hunting seat at Winchester, and the modern part of the palace at Hampton Court. Some of the most remarkable of his buildings, besides St. Paul's, are the monument on Fish Street Hill, the theatre at Oxford, the library at Trinity College, Cambridge; the hospitals of Chelsea and Greenwich; the church of St. Stephen's, Walbrook; those of St. Mary-le-Bow, St. Michael, Cornhill, and St. Bride, Fleet Street; and the great campanile of Christ Church, Oxford. The Royal Exchange and Custom-house, since destroyed by fire and re-erected, were among his works. As an architect he possessed an inexhaustible fertility of invention combined with good natural taste and profound knowledge of the principles of his art. His talents were particularly adapted to ecclesiastical architecture, but in his palaces and private houses he sometimes achieved monotonous results, as at Hampton Court. The interior of the church of St. Stephen's, Walbrook, which has been considered as his *chef-d'œuvre*, exhibits a deviation from common

forms equally ingenious and beautiful, and St. Paul's Cathedral may be fairly reckoned among the most magnificent productions of architectural genius. Yet the works of Wren have not passed without censure. Even in St. Paul's, while the grandeur of the whole work is admitted, many faults, and especially waste of interior space, are charged against him. Consult: 'Parentalia, or Memoirs of the Family of the Wrens' (1750); Elmes, 'Sir Christopher Wren and His Times' (1823); Clayton, 'Churches of Sir Christopher Wren' (1848); Milman, 'Annals of St. Paul's Cathedral' (1868); 'Life' by Phillimore (1883); Loftie, 'Inigo Jones and Wren' (1893); Marshall, 'Under the Dome of St. Paul's' (1899); Dimock, 'Handbook of St. Paul's Cathedral' (1900).

Wren, a family (*Troglodytidae*) of passerine birds, having a slender, slightly curved, and pointed bill, with the exposed nostrils partly concealed by a scale, the wings very short and rounded, with nine well developed and the first short primaries, the tail short, and often carried erect; the legs are robust and rather long. They are abundant in the neotropical region, less common in the nearctic, and only a few occur in the Old World in Europe, Asia, and Sumatra, those of the latter region being more or less aberrant. The known species exceed 100 and are arranged in about 15 genera, several of which are confined to tropical America. North America has six genera and 14 species. Closely related to the wrens are the mocking thrushes, which some ornithologists place in the same family, and the creepers (*Certhiidae*). The wrens are plain little birds usually clothed in modest browns and seldom exhibiting bright colors or very conspicuous markings. They are insectivorous and mostly migratory, though particular species may inhabit either warm or cold regions. Their haunts are mostly brush piles, tangled roots, stone walls and similar places, where they pry into every nook and cranny; they enter holes and reappear in another place in very mouse-like fashion; and are altogether very sprightly little creatures. Their songs are wonderfully loud and vehement for such small birds, but differ characteristically for each species. Although the nests vary greatly in their location, which is most often a hole of some sort, they are always more or less spherical in construction. Few passerine birds are more prolific, the eggs numbering from 5 to 10, and many of the species producing several broods.

Few birds are more familiar in the United States than the house-wren (*Troglodytes aëdon*). It is about five inches long. The color is very uniform, reddish brown above, barred with dusky, and pale fulvous white below. It often builds its nest near houses, and in boxes prepared for it or in any convenient hole. The nests are made to fill the boxes; and to effect this a large mass of heterogeneous materials is sometimes collected. From six to eight eggs constitute a brood and two or three broods are produced in a summer. The eggs are so thickly spotted with brown that they appear to be almost uniformly colored. The song is extremely rapid and vivacious as though the performer were overflowing with good spirits. The male is a very bold, pugnacious bird, readily attacking birds far larger than itself, as the bluebird and swallows, and taking possession of the boxes

WRESTLING—WRIGHT

which they have appropriated for their nests. It even attacks cats when they approach its nests and vigorously scolds all intruders.

The winter wren (*T. hyemalis*) is our smallest species of wren, only about four inches long, and the ridiculous little tail is usually cocked straight up into the air. Above, the color is a rich dark brown; below it is much lighter, both regions prettily barred. The typical form inhabits most of eastern North America, the Canadas, and northernmost United States during the summer and the rest during the winter. Except in the higher mountains, it is known in the New England and Middle States only in the latter season. It is a silent, secretive bird of the winter brush-heap and roadside, but withal bold and saucy and prone to state its opinion of intruders. The summer song is said to be powerful and musical, and the nest to be placed in a hole in a log or root near the ground. The eggs are white, spotted with reddish brown.

Of the genus *Citrothorus*, or marsh-wrens, we have three species, of which one (*C. meriame*) is a Florida form. See MARSH-WREN.

Thryothorus comprises the mocking wrens, of which *T. ludovicianus*, the great Carolina wren, is the best known Eastern species, and the largest of the wrens of this region. It is six inches long, of which the tail is $2\frac{1}{2}$ inches, about equaling the wings. It is nearly uniform bright reddish brown above with yellowish white under parts, a conspicuous white superciliary streak, and the wings and tail cross-banded with black. It lives east of the plains, but is more abundant South and scarcely gets northward beyond Pennsylvania, in which region, however, it is becoming more plentiful of late years. It inhabits deserted buildings, old mills, and shrubbery in secluded spots and builds its nest in crannies in such places, laying six or more white eggs speckled with various shades of brown. The loud clear whistled song is very characteristic and as this bird is scarcely migratory is heard in winter as well as summer in the neighborhood of Philadelphia. This bird also mimics the notes of others. Bewick's wren (*T. bewickii*) is a related species very abundant in the interior southward, while a number of other species and subspecies of the same genus are found in the West and Southwest. In the latter region also, as well as in Mexico and southward, occur several large wrens which have broad spreading tails composed of somewhat cuneate feathers. Among these are the cactus wrens (q.v.), which build purse-shaped nests in bushes in the desert regions of Texas, California, etc., and the rock-wrens and cañon-wrens (q.v.) which live and nest in rocky places. They have loud ringing songs. In Europe are several species of *Troglodytes*, of which the beloved common or jenny wren (*T. parvulus*) is found in all parts of Europe, and in Morocco and Algeria, and in Asia Minor and northern Persia. In central Asia it is represented by *T. pallidus*, in Iceland and the Faroes by *T. borealis*, and in Norway by *T. bergensis*. In England the vernacular name wren is also applied to various species of warblers, and elsewhere to other small birds.

Consult: Baird, Brewer, and Ridgway, 'Land Birds of North America' (Boston 1874); Sharpe, 'Catalogue Bird of the British Museum,' Vol. VI. (London 1881).

Wrestling, the most ancient form of athletic exercise, and at one time the favorite pastime of the Greeks. The Olympic Games (q.v.), the great festival of the Greeks, which were instituted for the exhibition of various trials of strength and skill, included races on foot, and with horses and chariots, contests in leaping, throwing, boxing, and wrestling. One of the great objects of the old classical wrestlers was to make every attack with elegance and grace under certain laws of a most intricate nature, and the game is described by Plutarch as the hardest working form of athletics. In Devon and Cornwall, England, wrestling on the catch-hold principle still finds favor. In Lancashire they adopt a catch-as-catch-can style; while in Cumberland and Westmoreland the ancient back-hold system continues to hold its own. In the United States and Australia, in Germany, France, and Japan, ground wrestling, which is the most objectionable of all known methods, is the most popular. This system has been dignified by the title of Græco-Roman wrestling. The Græco-Roman style is practically the same as the French method, and consists of a struggle on the ground till one or other of the combatants is compelled through sheer exhaustion to give in; indeed, such a contest is simply an exhibition of brute strength. On commencing, the wrestlers take hold from the head and not lower than the waist, when both roll on the ground, and then the actual struggle begins. Tripping, which is the very essence of the game, is not allowed; therefore weight and strength are the only factors in the contest, which terminates when one of the combatants has been placed on both shoulders. Wrestling has recently become popular in Japan and India. The Japanese have adopted the Græco-Roman style, and receive handsome rewards at the conclusion of their contests. The Jap wrestlers, who are a most formidable class of men, before entering the arena adorn themselves with a certain kind of paint, with a huge belt round the waist and their enormous calves encased in stout leggings. The Indians, on the other hand, wrestle in bathing costume, and in a match only contest one bout, and one shoulder on the ground is deemed a fall.

Wrexham, *reks'am*, North Wales, a market-town in the county of Denbigh, 12 miles south of Chester, in a district containing coal, lead, and iron. It is a station on the Great Western and Great Central railways, and has several churches and other places of worship, schools, guildhall, infirmary, barracks, market-halls, public baths, electricity-works, free library, etc. The restored parish church, dedicated to St. Giles, was erected in the reign of Henry VII. There are in the town large breweries, tanneries, etc.

Wright, *rit*, Albert Allen, American geologist: b. Oberlin, Ohio, 27 April 1846; d. there 2 April 1905. He was graduated from Oberlin College in 1865, in 1872 and 1882 was attached to the Ohio Geological Survey, and was professor of geology and zoology at Oberlin from 1874.

Wright, Arthur Williams, American physician: b. Lebanon, Conn., 8 Sept. 1836. He was graduated from Yale in 1859, studied law and was admitted to the bar, but did not practice, and was a tutor in Latin at Yale 1863-6, and

WRIGHT

in physics 1866-8. He afterward studied at Heidelberg and Berlin, was professor of physics and chemistry at Williams College 1869-72, of molecular physics and chemistry at Yale 1875-87 and of experimental physics there since 1887. From 1885 he has been in charge of the Sloane physical laboratory at Yale. He has published numerous professional papers, is a fellow of the Royal Astronomical Society of Great Britain and a member of various other learned societies.

Wright, Carroll Davidson, American statistician and sociologist: b. Dumbarton, N. H., 28 July 1840; d. Worcester, Mass., 20 Feb. 1909. After studying law, he enlisted in the 14th New Hampshire volunteers at the outbreak of the Civil War, and in 1864 became its colonel. In 1865 he was admitted to the bar at Keene, N. H., in 1867 began practice at Boston, in 1873-3 was a member of the Massachusetts senate, and in 1873-88 chief of the Massachusetts bureau of labor statistics. He was appointed national commissioner of labor in 1885, and he continued in this office for some time after his election as president of the collegiate department of Clark University (Worcester, Mass.) in 1902. In 1895 he became honorary professor of social economics in the Columbian University (Washington, D. C.), and delivered lectures in numerous institutions. He was chosen president of the American Statistical Association, in 1902 chairman of the section on social and economic science in the American Association for the Advancement of Science and vice-president of the association, and in 1903 president. He was recorder of the commission appointed by the President to arbitrate in connection with the anthracite coal strike in the fall of 1902. In 1906 the order of SS. Maurizio e Lazzaro was conferred upon him by the King of Italy in recognition of his services as political economist. Besides numerous contributions to periodicals, he has written 'The Industrial Evolution of the United States' (1895); and 'Outlines of Practical Sociology' (1899).

Wright, Charles Henry Hamilton, Irish Anglican clergyman: b. Dublin 9 March 1836. He was graduated from Trinity College, Dublin, in 1857, was Bampton lecturer at Oxford in 1878, Donnellan lecturer at Dublin 1880, Grinfield lecturer on the Septuagint at Oxford 1893-7, and vicar of St. John's, Liverpool, 1891-8. Among his numerous publications are: 'Fragments and Specimens of Early Latin' (1874); 'The One Religion' (1881); 'Biblical Essays' (1885); 'Roman Catholicism in the Light of Scripture,' 2d ed. (1897); 'The Intermediate State and Prayers for the Dead' (1900); 'Genuine Writings of Saint Patrick with Life' (1902).

Wright, Fanny. See D'ARBUSMONT, FRANCES.

Wright, Eliza, American abolitionist expert: b. South Canaan, Conn., 12 Feb. 1804; d. Medford, Mass., 21 Nov. 1885. He was graduated at Yale in 1886, was professor of mathematics in Western Reserve College in 1829-33, and became identified with the anti-slavery movement in the last named year. He then removed to New York, where he edited 'Human Rights' (1834-5) and the 'Quarterly Anti-Slavery Magazine' (1837-8), and was at the same time secretary of the Anti-Slavery Society. Removing to Boston in 1838 he there

edited the 'Massachusetts Abolitionist,' the 'Daily Chronotype' (1845), and 'The Commonwealth,' its successor (1850). He published 'Savings Banks Life Insurance' (1873); 'The Politics and Mysteries of Life Insurance' (1873), etc.; and was (1858-66) insurance commissioner of Massachusetts. He wrote an introduction to Whittier's poems (1844); and published a translation in verse of 'La Fontaine's Fables' (1859).

Wright, George Frederick, American educator and geologist: b. Whitelaw, N. Y., 22 Jan. 1838. He was educated at Oberlin College and Theological Seminary, and held Congregational pastorates at Bakersville, Vt., 1862-72, and Andover, Mass., 1872-81. He was professor of New Testament literature in Oberlin College 1881-92, and of the harmony of science and revelation since the last named year. He was connected with the United States Geological Survey 1884-92. His works include: 'The Logic of Christian Evidence' (1880); 'Studies in Science and Religion' (1882); 'The Relation of Death to Probation' (1882); 'The Glacial Boundary in Ohio, Indiana, and Kentucky' (1884); 'The Divine Authority of the Bible' (1884); 'The Ice Age in North America'; 'Man and the Glacial Period'; 'Aspects of Christian Evidences' (1898); 'Asiatic Russia' (1902), etc. He has edited the 'Bibliotheca Sacra' since 1884.

Wright, Horatio Gouverneur, American military officer: b. Clinton, Conn., 6 March 1820; d. Washington, D. C., 2 July 1899. He was graduated at West Point in 1841, was superintending engineer of the building of Fort Jackson at Tortugas, Fla. (1846-56); lighthouse engineer in Florida (1852-3); and assistant to the chief of engineers in Washington (1856-61). He was active throughout the Civil War, became brigadier-general of volunteers in September 1861, and took command of the Department of Ohio in August 1862. He commanded a division at the battle of the Wilderness, a corps at Spotsylvania Court House and Cold Harbor, 3 June; served as major-general at the battle of Opequan Creek, 19 Sept. 1864, and contributed to the decisive victory at Cedar Creek, 19 Oct. 1864. He was brevetted major-general in the United States army for his services at the capture of Petersburg, 13 March 1865, and was mustered out of the volunteer service 1 Sept. 1866. He then returned to regular army duty as lieutenant-colonel of engineers, becoming brigadier-general and chief of engineers 30 June 1879, retiring 6 March 1884.

Wright, John Henry, American classical scholar: b. Urumyah, Persia, 4 Feb. 1852. He was graduated from Dartmouth in 1873, and studied at Leipzig 1876-8. He was associate professor of Greek at Dartmouth 1878-86, professor of classical philology at Johns Hopkins 1886-7, and since 1887 professor of Greek at Harvard and dean of the graduate school from 1895. He has been editor-in-chief of the 'American Journal of Archaeology' from 1897, and has edited several important works.

Wright, John Vines, American jurist: b. Purdy, Tenn., 23 June 1828. He was admitted to the bar in 1852 and was a member of Congress in 1855-61. During the Civil War he served in the Confederate army, first as captain and later as colonel of the 13th Tennessee regi-

WRIGHT

ment; until elected to the Confederate Congress, in which body he remained till the fall of the Confederacy in 1865. He then became a judge of the circuit court and afterward chancellor and judge of the Tennessee supreme court. In 1880-90 he was chairman of the Northwest Indian Commission and concluded many treaties with Indians. He was defeated for governor of Tennessee in 1880. Died 12 June 1908.

Wright, Joseph, American artist: b. Bordentown, N. J., 16 July 1756; d. New York 1793. He obtained his art education in England and Paris, in 1783 returned to America, and in that year painted a portrait of Washington. Subsequently he executed another for the Comte de Solms, and still later a miniature profile. Among his other portraits were those of Jay and Madison. In 1792 he was made first draughtsman and die-sinker in the mint newly established at Philadelphia. He was the designer of the first coins and medals struck by the national government.

Wright, Joseph, English philologist: b. 31 Oct. 1855. From 1891 to 1901 he was deputy-professor of comparative philology in the University of Oxford, and in 1901 was made professor. Among his publications are a rendering of Brugmann's 'Grundriss der vergleichenden Grammatik der Indogermanischen Sprachen,' Vol. I.; text-books of Middle and Old High German, and a grammar of the dialect of Windhill in the West Riding of Yorkshire. But he is known for his 'English Dialect Dictionary,' begun in 1896, and announced to be completed in 1905. This is of much value to the special student.

Wright, Julia McNair, American author: b. Oswego, N. Y., 1 May 1840; d. Philadelphia, Pa., 2 Sept. 1903. She was married in 1859 to Rev. W. J. Wright and published numerous temperance and anti-Roman Catholic stories, among which were 'Almost a Nun'; 'Priest and Nun'; 'The Gospel in the Riviera'; 'The Heir of Athole.'

Wright, Luke E., American lawyer and administrator: b. Memphis, Tenn., 1847. He studied law, was admitted to the bar, and began the practice of his profession at Memphis, where he soon attained a leading rank among the lawyers of the city. In 1878 he was one of the most active in the relief work during the yellow fever scourge; and in 1880-8 was attorney-general of the State. In politics he has been affiliated with the Democratic party, but in 1896 supported the Gold Democrats. In 1900 he was appointed a member of the Philippine Commission; and on the organization of civil government in the Philippines was placed at the head of the department of commerce and police, and shortly afterward was appointed to the newly created office of vice-governor. He was thus acting governor during Governor Taft's absence in 1902; and in 1903, when Taft was appointed secretary of war, he was appointed governor-general of the Philippines. He was American ambassador to Japan 1906-7, and became Secretary of War, July 1908.

Wright, Mabel Osgood, American writer on nature, daughter of Samuel Osgood (1812-80) (q. v.); New York 1859. She was married in 1884 to J. O. Wright and has made her home in Fairfield, Conn. She has edited 'Bird

Lore,' with F. M. Chapman, and has published 'The Friendship of Nature,' a series of outdoor studies (1894); 'Birdcraft,' a book on New England birds (1895); 'Tommy-Anne: A Natural History Story' (1896); 'Citizen Bird,' a book for beginners (1897); 'The Dream Fox Story Book' (1900); 'The Flowers and Ferns in Their Haunts' (1901); 'Dogtown' (1902); 'The Garden, You and I' (1906); 'Gray Lady and the Birds' (1907); etc.

Wright, Marcus Joseph, American soldier, brother of J. V. Wright (q. v.): b. Purdy, Tenn., 5 June 1831. He studied law, was admitted to the bar and practised his profession in Memphis till the outbreak of the Civil War, when he entered the Confederate army as lieutenant-colonel of a Tennessee regiment. He was promoted brigadier-general in 1862 and was wounded at Shiloh. He has written 'Life of Gen. Winfield Scott' in 'Great Commander' series (1894); 'Life of Governor William Blount'; etc. Since 1878 he has been agent of the War Department for collections of military records.

Wright, Mary Tappan, American novelist: b. Steubenville, Ohio, December 1851. She was a daughter of Eli Tappan, a president of Kenyon College, and in 1879 was married to John Henry Wright (q. v.). Her work in fiction, which displays much keen characterization and charm of style, includes: 'A Truce and Other Stories' (1893); 'Aliens' (1902); 'The Test' (1904).

Wright, Silas, American statesman: b. Amherst, Mass., 24 May 1795; d. Canton, N. Y., 27 Aug. 1847. He was graduated at Middlebury College, Vt., in 1815, studied law, was admitted to the bar in 1819, and established himself as an attorney at Canton. In 1823 he entered the State senate, where he steadily opposed the political advancement of De Witt Clinton, which he regarded as dangerous to the Democratic party, of which throughout his life he was a firm adherent. He sat in Congress 1827-9, and there advocated and voted for the protective tariff of 1828. He also voted for the appointment of a committee to inquire into the expediency of abolishing slavery and the slave trade in the District of Columbia. He was comptroller of New York 1829-33, and a United States senator 1833-44. He supported Clay's compromise bill in 1833; voted against receiving a petition for abolishing slavery in the District of Columbia, and in favor of excluding from the mails all "printed matter calculated to excite the prejudices of the Southern States in regard to the question of slavery"; voted for the tariff of 1842, though most of his political associates in the senate voted against it; and voted for the annexation of Texas to the Union. In 1844, against his will, he was nominated by his party to be governor of New York, and was elected. President Polk offered him the office of secretary of the treasury in 1845, but he declined it, as he had previously declined a seat on the supreme bench. As governor he vetoed a bill appropriating money for works on the canals, on the ground that the effect of the bill was to resume the enlargement of the canals, which had been suspended by law in 1842, out of regard for the financial safety of the State; recommended legislation against the anti-renters, and on occasion of disturbances produced by them in Delaware County in 1845

WRIGHT — WRIGHTSVILLE

proclaimed the county to be in a state of insurrection and called out a military force. Nominated for re-election in 1846, he was defeated by the Whig candidate. When the application of the Wilmot proviso to the territories obtained from Mexico was under discussion, Wright emphatically declared that the arms and the money of the Union ought never to be used to acquire territory then free for the purpose of planting slavery upon it. On the expiration of his term as governor he returned to his farm at Canton. Consult 'Lives' by Jenkins (1847); Hammond (1848); Gillet (1874).

Wright, Thomas, English antiquary: b. Tenbury, Shropshire, 23 April 1810; d. Chelsea, London, 23 Dec. 1877. He was graduated at Trinity College, Cambridge, settled in London, and devoted himself to the study of English history, literature, and antiquities. He was one of the founders of the Camden Society, and of the British Archaeological Association, whose journal he edited 1843-50. Of the Percy Society and the Shakespeare Society he was also an active member, and in 1842 he was chosen a corresponding member of the French Academy of Inscriptions. He edited a great number of rare works connected with Early English literature and history which have been published in England by the societies above mentioned, and also published 'Queen Elizabeth and Her Times' (1838); 'Essays on the Literature, Popular Superstitions, and History of England in the Middle Ages' (1846); 'Narrative of Sorcery and Magic' (1851); 'The Celt, the Roman, and the Saxon' (1852, 5th ed. 1890); 'Wanderings of an Antiquary' (1854); 'The History of Ireland' (1857); 'Dictionary of Obsolete and Provincial English' (1858); 'History of France' (1858-60); 'Essays on Archaeological Subjects' (1861); 'Manners and Sentiments in English During the Middle Ages' (1862); 'History of Caricature and the Grotesque' (1865); 'Womankind in Western Europe' (1869).

Wright, Thomas, English biographer: b. Olney, Buckinghamshire, 16 May 1859. He was educated at Baxton College, Forest Gate, and is now (1904) principal of the Cowper School at Olney. He is the founder of the Cowper Society and has published 'The Town of Cowper' (1886); the novels 'The Chalice of Carden' (1889); 'The Blue Firedrake' (1892); and 'The Mystery of St. Dunstan's' (1892); 'Life of William Cowper,' the standard biography of the poet (1892); 'Life of Daniel Defoe' (1894); 'The Correspondence of William Cowper' (1900); 'Go, or How to Succeed in Life' (1902); etc.

Wright, William Aldis, English scholar: b. 1836. He was a contributor to Smith's 'Dictionary of the Bible' (1860-3), secretary to the Old Testament Revision Company in 1870-85, and from 1868, the year of its establishment, editor of the 'Journal of Philology'. In 1888 he became vice-master of Trinity College, Cambridge. With W. G. Clark (q.v.), he collaborated on the 'Cambridge Shakespeare' (1863-6) and the 'Globe' edition of Shakespeare's complete works (1864). Among his other publications are editions of the 'Letters and Literary Remains of Edward Fitz-Gerald' (1889); of the 'Facsimile MSS of Milton's Minor Poems' (1899); 'Fitz-Gerald's Miscellanies' (1900); 'More Letters of Edward Fitz-Gerald' (1901);

'Literary Remains of Edward Fitz-Gerald' (1902-3); and 'Milton's Poetical Works' (1903).

Wright, William Burnet, American Presbyterian clergyman: b. Cincinnati, Ohio, 15 April 1838. He was graduated from Dartmouth in 1857, was four years pastor of the South Congregational Church, Chicago; 20 years pastor of the Berkeley Street Church, Boston, and three of the First Congregational Church, New Britain, Conn., and subsequently of the Lafayette Avenue Presbyterian Church, Buffalo, prior to 1901. He has published 'Ancient Cities from the Dawn to the Daylight' (1887); 'The World to Come' (1887); 'Master and Men' or 'The Sermon on the Mountain Practised on the Plain' (1894).

Wrightia, an apocynaceous genus of small trees and shrubs, with long loose branches, named after William Wright (1740-1827), a Scotch botanist resident in Jamaica. The flowers are salver-shaped, white, yellow, or red, usually in terminal cymes, and have a short corolla-tube, five or more scales at the throat, and an exerted cone of sagittate anthers. *W. tinctoria* is a small tree, a native of Burma and Southern India. The wood resembles ivory in its hard, close grain, and exquisite whiteness, and like that of other species of the genus, is used for small articles of turnery. The tree is also known as ivory-tree, Pala, and palay. The seeds are said to be used in dyeing, and the leaves, with the seeds of *Cassia tora*, yield a blue dye known as pala-indigo, but inferior to the genuine indigo. *W. tomentosa*, a small, deciduous tree, growing in India and Burma, has a yellow juice, which, mixed with water, produces a permanent yellow dye. It is used by the Nepalese to stop bleeding, and the bark is given as an antidote to snakebite. *W. antidysenterica*, a small tree found in India and Burma, is a most valuable remedy for dysentery; the Arabs and Persians consider the seeds as carminative, astringent, tonic, and aphrodisiac. This tree is now classified under *Holarrhena*, and is a principal source of conessi- or pala-bark.

Wrightsville, York County, Pa., on the Susquehanna River, 31 miles southeast of Harrisburg and 11 miles northeast of York, was the farthest point east reached by the Confederates during the Civil War. In the campaign preceding Gettysburg Gen. Early was ordered to seize the bridge across the Susquehanna at this point, a wooden structure over a mile long, resting on stone piers. Included in the structure was a railroad bridge, a pass-way for wagons, and also a tow-path for the canal which here crossed the Susquehanna. On 28 June 1863 the bridge was defended by the 27th Pennsylvania militia, a few companies of the 20th and some other organizations and convalescents hastily collected, in all numbering about 1,200 men, under command of Col. J. G. Frick, 27th militia. Frick held an intrenched line about a half mile west of Wrightsville. Gen. Gordon's brigade, with Capt. W. A. Tanner's battery and White's battalion of cavalry, marching through York, appeared before Frick's position on the evening of 28 June and began skirmishing, under cover of which Gordon endeavored to cut him off from the bridge by a flank movement, but failed, and then opened fire with Tanner's artillery, to which Frick

could not reply, being without guns. His rear threatened, Frick retreated across the bridge and fired it, leaving 18 or 20 prisoners in Gordon's hands. Gordon attempted to follow, but was checked by the flames. The bridge was totally destroyed and the flames communicated to the town of Wrightsville, consuming several buildings, but the further progress was arrested by Gordon's men. The destruction of the bridge was a keen disappointment to Early, who had hoped to cross it and attack Harrisburg from the east side of the river. On the 20th Gordon marched back to York.

E. A. CARMAN.

Writ. In general understanding a writ is a mandatory precept issued by the authority of and in the name of the executive branch of the State for the purpose of compelling the defendant to do some particular thing mentioned in the instrument. Writs are generally classified as mandamus, habeas corpus, summons, error, quo warranto, certiorari, or review. Writs are further distinguished as original and judicial. Original issued without any order of the court in the particular case, judicial issued in pursuance of a decree or order or judgment of the court. A writ of mandamus is a command issuing from a court of law of competent jurisdiction, in the name of the State, directed to some inferior court, officer, corporation, or person, requiring them to do some particular thing therein specified, and which appertains to their office or duty. In order to secure a writ of mandamus it is necessary to show (1) that the petitioner has a legal right to have the thing done which it is sought to be done; (2) that it is the duty of the respondent to perform it; (3) that the writ is the only plain, speedy, and adequate remedy. A writ has a purely personal effect. An injunction—either mandatory or prohibitory—is a writ framed according to the circumstances of the case commanding an act which the court regards as essential to justice, or restraining an act which it esteems contrary to equity and good conscience. Quo warranto is an order to show by what authority a given act is done or office held. A writ of error is a commission to a superior court by which they are authorized to examine the record in a case on which judgment has been given in an inferior court. Habeas corpus is an order issued by a magistrate to an officer in charge of the person of the defendant and designed to give summary relief against illegal restraint of personal liberty. Summons is a demand made to a person to appear at a given time before a court or officer. Certiorari or review is an order to a superior court to review the evidence presented before an inferior court.

Writers' Cramp, or Scriveners' Cramp or Palsy, an occupation-neurosis to which those who do much writing, especially with the hand too tightly contracted, are very liable. A person with this trouble has no complete control over the muscles of the thumb and middle and fore fingers, brought into use in writing, although other manual operations are performed without difficulty. The affection seldom manifests itself till toward middle age. The various methods of treatment that have been proposed have not been very successful. Small surgical operations have been performed with occasional but far from general good results. The application of electricity to the adductor of the thumb,

and the kneading of the muscles of the ball of the thumb and the lower part of the forearm, so as to promote the circulation in those parts, are said to be beneficial, but the only way to obtain perfect relief is for the patient to abstain from writing altogether. If he is obliged to write he will do so with more ease if he uses a pen with a very thick handle. For extreme cases several contrivances have been devised for assisting the patient to write by altering the movements of the fingers in writing, and giving support to the ball of the hand. The typewriter has proved the best resource of those who suffer from the ailment. See NEUROSES; OCCUPATION, HYGIENE OF.

Writers to the Signet, in Scotland, where lawyers generally are called writers, an incorporated legal society dating from an early period of Scottish history. Originally, the name probably applied to clerks in the office of the secretary of state, where was deposited the seal by which the king's letters and writs for the purposes of justice were authenticated. This duty was monopolized by this close society of practitioners, members being appointed not by public officials, but by the organization. Thus the Writers to the Signet came to control admissions to the bar, like the English Inns of Court (q.v.). They still retain a certain prestige at the bar, but not their former monopoly.

Writing, the art of recording ideas by means of characters or figures of some sort impressed upon some kind of material substance. History, though it does not throw complete light on the origin of writing, suffices to show certain stages in its progress, and upon these a classification has been founded, which is, however, incomplete and unsatisfactory. The simplest classification, and perhaps at an initiatory stage the best, is that which divides all writing into ideographic and phonographic, or signs representing the things symbolized by words, and signs representing sounds, that is, words themselves. Less satisfactory is the classification of writing into three historical stages, the figurative, the transitional or conventional, and the alphabetic. In the first of these, to which hieroglyphic writing belongs, writing is supposed to be pictorial, or immediately representative of objects. After this, in the transitional period comes symbolical writing, in which abbreviated pictures are transformed into arbitrary symbols, first of things, and afterward of sounds and words. Lastly, with the prevalence of phonetic writing sounds are represented first in syllables, and afterward in letters. The course of writing is generally in the direction thus indicated, but it is inaccurate and misleading to represent these stages as epochs in its progress. As the most modern writing contains traces of the first of these methods, so the earliest contains traces of the last. The majority of the letters in modern alphabets can be traced to symbols, or abbreviated pictures representative of things, but as the thing originally represented is usually an object whose name begins with the sound represented by the letter, there is no evidence that the sign was not originally intended in a double sense and used as a phonograph. In Egyptian hieroglyphics we have ideographs and phonographs mixed together. This, however, does not prove the absolute precedence of ideographs, but only the imperfection of the phono-

WRITING

graphic elements in that system. The same thing occurs in the Mexican picture writing, which was long supposed to be purely ideographic. Its phonetic signs are syllabic, not alphabetic. In our own system we use figures and other symbols when phonographic signs are too slow for our purpose, and with a less perfect phonographic system this would naturally occur much more frequently. It does not appear, moreover, that any transition from pictorial to phonetic writing is necessary through arbitrary non-phonetical symbols. Both of these modifications would no doubt proceed simultaneously from independent causes. Pictorial signs not phonetized would be abbreviated as well as phonetized signs, and when the phonetized abbreviations came to prevail the non-phonetized abbreviations would be phonetized also, thus producing the appearance of a transition from arbitrary symbols to phonetic signs.

The reason why writing has had to pass through various stages of pictorial and more or less arbitrary symbolical representation before reaching the more perfect development of the alphabetic form is not very difficult to discover, and it has an important bearing on the order of development. It is not because the representation of words is in itself more difficult to conceive of than the representation of things, or because when the desire for writing as a medium of communication is excited the human intellect is inadequate to the task of forming at once an entire phonetic system. Had phonetic or even alphabetic representation been the only possible means of constructing a written symbol all difficulties would doubtless have been overcome by one sustained effort, as they have actually been by many partial ones; but as an easier process was to be found, and would directly suggest itself as a means of meeting the immediate demand, the more elaborate process was excluded and prevented by this process from being performed. Nothing is easier than to make a rude pictorial representation of certain objects. To draw something resembling a man would be easier than to agree on a sign to represent the word man, hence ideographs would naturally precede phonetic symbols. But for the same reason the earliest systems of writing would not be purely ideographic but mixed. There are many things which form the subject of the least sophisticated human communications which cannot be represented pictorially. When writing was first practised these things were already represented by words, and the idea would naturally occur to form a sign to represent the word, that is, a phonetic sign. These signs could not be directly pictorial, but they might be allegorical or symbolic, and in the absence of analysis of sound they probably would take that form, although the direct intention was to suggest conventionally a specific word by the symbol. This sort of symbol might be called a mnemonic. From such symbols to merely arbitrary syllabic and alphabetic symbols the transition would be easy.

It is generally agreed that writing was introduced to the western nations by the Phœnicians, and it is commonly believed that the Phœnician system was based on the Egyptian, but the comparative antiquity of the Egyptian and Assyrian or Akkadian, the hieroglyphic and cuneiform systems, cannot be definitely determined. The Egyptians attributed their writing

to Thoth, and the first characters are said to have consisted of portraits of the gods. The cuneiform writing, which is cumbersome and exceedingly difficult to read, has been adapted to several languages, the Akkadian, the Assyrian, the Persian, etc., in a variety of ways, ideographic, syllabic, and alphabetic. The Egyptians had three distinct kinds of writing, the hieroglyphic, the hieratic, and the enchorial or demotic. The first is a mixed system, containing large numbers of signs of various characters, ideographic and phonetic. It is used chiefly for inscriptions on monuments and public buildings. The hieratic is a cursive hand abridged from the hieroglyphic for use on papyri. Both these forms were sacred, and the priestly caste only were initiated in them. The demotic was introduced much later than the other forms. It was used for trading and common purposes, and in civil documents. The hieratic writing was more phonetic than the hieroglyphic, and the alphabetic character prevailed in the demotic. The first was written in any direction according to the form of the surface; the hieratic was at first written in columns, but afterward always in horizontal lines. The hieratic and demotic are read from right to left, but the individual letters are formed from left to right. The connection between the Egyptian and the Semitic writings, to which the Phœnician belongs, is by no means unanimously admitted, many scholars holding that the resemblances between them may be explained by the independent adoption of common principles. The leading Semitic forms are the Samaritan or ancient Hebrew, the Chaldee or East Aramaic, the Syriac or West Aramaic, and the Kufic or early Arabic, which continued to be used in MS. for several centuries after the Mohammedan conquest, after which it was replaced by the Nashki or modern Arabic, which, with some slight modifications, is the same with the modern Persian. The Hebrew alphabet now in use, the Babylonian or East Aramaic, is entirely consonantal, the vowel points being of modern origin. The Phœnician which formed the basis of the western languages was of a similar character. Phœnician writing was anciently represented to have been brought by a Cadmean colony to Boœtia about the 16th century B.C. (see CADMUS); and a certain number of the Greek letters are undoubtedly of Phœnician origin. (See the section on language and writing in the article GREECE.) The Greeks at first wrote from right to left, and afterward adopted the method called *boustrophædon*, from the motion of the ox in plowing, that is, alternately from right to left, and from left to right. Writing from left to right was said to have been introduced in the time of Homer by Pronapides of Athens. The various modifications which the Phœnician or Pelasgian forms underwent in Italy are to be found by comparison of the Oscan, Etruscan, Umbrian, and early Latin inscriptions. In the ancient Greek and Roman writing, and even for a time in the mediæval writing of Europe, the words were not separated by spaces, and no punctuation marks were used. The present cursive characters with modifications occur in Greek inscriptions of the age of Augustus. In mediæval manuscripts a variety of styles were adopted in different epochs and countries, and for different uses, to describe which in detail would require a separate treatise. In France the various styles were called after

the dynasties under which they prevailed: Merovingian, Carolingian, Capetian, Valesian, and Bourbon. There were also a variety of styles used for different purposes distinguished by such names as *majuscule* and *minuscule* (great and small letters), diplomatic minuscule, and many others. Capitals were not then used as now to distinguish prominent words, but whole manuscripts were written in large or small capitals. There were also a variety of mixed styles. From the 8th to the 11th centuries writing with *tremblements* was affected in France. The diplomatic minuscule was a mixture of minuscule and cursive characters distinguished by an unusual prolongation of the long letters. Uncial letters, which prevailed from the 7th to the 10th centuries, were rounded capitals with few hair-strokes. The practice of ornamenting pages began in the 8th century, and the earliest manuscripts are also without title-pages. The so-called Gothic characters, in reality of scholastic origin, are merely fanciful deviations from the Roman types, such as the rounding of straight limbs, the substitution of angular facets for rounded forms, with hair-lined projections from the extremities contrasting with massive body-strokes. They became common in inscriptions from the 13th to the 15th centuries, and were employed in church-books from the time of St. Louis. The Gothic cursive was introduced about the middle of the 13th century. The modern German alphabet was also introduced in the 13th century. In England a variety of styles called Saxon prevailed in the early Middle Ages. An elegant mixed style was formed of a combination of Roman Lombardic and Saxon characters. The Norman style of writing came in with William the Conqueror. The old English form of Gothic dates from the middle of the 14th century. The English "court hand," an adaptation of Saxon, prevailed from the 16th century to the reign of George II. In regard to the antiquity of writing in other parts of Europe, it was known to the Gauls before the time of Caesar; but no traces of the ancient writing remain, and whether it was derived from the Greeks or the Phœnicians is doubtful. There are slight traces of writing in Britain previous to the Roman period, but if it were employed by the Druids, as Caesar says, it may have existed without leaving remains. The Germans claim the knowledge of writing previous to their contact with the Romans; but in their case also we are without early remains. The Runic alphabet used for many centuries in Denmark, Norway, etc., may have been employed long before the Christian era.

In the East we find one of the most striking contrasts in the history of language. The Chinese, who have an ancient system of writing which they attribute to Fou-hi, have never reached the alphabetic system. Their characters are syllabic, and as Chinese words are monosyllables, they are strictly ideographic. They have been adopted in this way by peoples speaking not only different dialects, but different languages, who apply the signs to words of different sound but of the same signification as the original. The Chinese system is said to contain 40,000 characters. They were originally hieroglyphic, but from difficulty of interpretation have become conventional. There are, of course, certain general principles of combination and construction, but to master the whole system is said

to be the work of a lifetime. Only a limited portion of it can therefore have any real existence as a medium of communication. Sanskrit, on the other hand, possesses the most perfect known alphabet. The Hindus claim to have derived it from the gods, and call one form of it *devanāgarī* (divine city). It is wholly different from the Semitic, and is founded on a much more complete and subtle analysis of sound. Its consonant signs number 33, its vowel signs 14. They are applied with an analytical method which gives a power of distinction vastly superior to that of European alphabets, and which is greatly admired by scholars. Sanskrit is written from left to right. By means of its derivatives it is widely diffused in the East. The Pali, which forms the sacred language of the Buddhists, has carried it far beyond India. The Burmese Pali character is square, the Siamese round. To complete the vagaries which have prevailed in the direction of writing, the Mexican picture writing was written from bottom to top. See ALPHABET; CUNEIFORM WRITING; ETYMOLOGY; HIEROGLYPHICS; LANGUAGE; PHILOLOGY; SCIENCE OF LANGUAGE; SPEECH.

Wroettes, rō'tta, a sect named from John Wroe, who died in Australia 6 Feb. 1863, and who claimed to have received Divine revelations. They are few in numbers, and sometimes called Christian Israelites. They teach the immediate second coming of Christ.

Wrong, George McKinnon, Canadian educator: b. Ontario 25 June 1860. He was educated at University and Wycliffe colleges in Toronto, took orders in the Church of England and in 1894 succeeded Sir Daniel Wilson as professor of history in the University of Toronto. He is co-editor with H. H. Langton of the annual 'Review of Historical Publications Relating to Canada.'

Wrybill, an extraordinary plover (*Archynchus frontalis*) of New Zealand, which is unique in having a bill bent sideways near the tip,—always toward the right. By this peculiarly adapted instrument it seems to be able to reach and obtain many small crustaceans, etc., which are able to creep under stones out of reach of all the other shore-birds of the region, which have only the ordinary straight kind of beak. The questions and inferences which arise in the mind of the evolutionist in view of this case will be found treated in Newton's 'Dictionary of Birds,' with references to other authorities. See PLOVER.

Wryneck, a European bird (*Jynx or Jynx torquilla*), related to the woodpeckers, which has a habit of twisting its head in a curious manner. This bird visits Great Britain in summer, arriving in April, usually with or just before the cuckoo, and hence is named the "cuckoo's mate." The food consists of insects, and chiefly of ants and their pupæ. It is also said to eat elderberries. The tongue is long and extensile, like that of the woodpeckers. The nest is formed in the holes of trees; and the eggs vary from six to ten.

Wryneck. See TORTICOLLIS.

Wu-chang, woo'chāng', or Woo-chang, China, a city of the province of Hu-peh, on the Yang-tse-kiang, opposite the city of Hankow. The latter is in effect but a suburb of Wu-chang, another portion on the north bank of the

river being Hanyang. It is the great emporium for the tea exported by way of Shanghai. Pop. variously estimated from 500,000 to 1,000,000.

Wu-hu, woo'hoó', China, a treaty-port, opened in 1877, in the province of Ngan-hwei, on the right bank of the Yang-tse-kiang river, about 200 miles west of Shanghai. Some manufactures and a considerable trade are carried on. The number of vessels entered in 1901 was 2,002, with a total tonnage of 2,098,840. The total value of the imports in that year was \$5,776,810, comprising cottons, opium, sugar, kerosene, bags, woollens, metals, etc.; and the exports were valued at \$4,080,145, including rice, rape-seed, raw silk, wheat, feathers, beans, ground-nuts, etc. Wu-hu suffered severely in the Tai-ping rebellion. Pop. 92,000.

Wu Ting-fang, woo'ting'fáng', Chinese diplomatist: b. near Canton. After education at Canton and Hong Kong, he went to England in 1874 for the study of law, having found Chinese merchants greatly at disadvantage through ignorance of the English language and law, and was the first Chinese to be made a barrister (1877). He established himself in successful practice at Hong Kong, where his services proved of great value. For several years he was a secretary on the official staff of Li-Hung-Chang, but first came prominently into notice as secretary of the peace commission to Japan after the war with that country. His skill in these diplomatic negotiations obtained for him the post of envoy extraordinary and minister plenipotentiary to the United States, Spain, Mexico, and Peru (May 1897). During the Boxer troubles in the summer of 1900 he made skilful representations to the state department, for which when no news was obtainable from Peking, he transmitted a message to Minister Conger and secured an answer. He used English fluently; was stated to have been the first Chinese minister to address American audiences, which he did frequently; wrote numerous articles for American magazines; and received the degree of LL.D. from the University of Pennsylvania. In 1902 he was recalled, and in 1903 became vice-president of the newly established Chinese "board of commerce."

Wulfenite, native lead molybdate. It is generally admitted that the best specimens of this mineral are among the most beautiful minerals known. It crystallizes in hemimorphic tetragonal crystals. They are usually in square tabular plates, sometimes very thin and transparent, but occasionally in elongated pyramidal forms and nearly opaque. The mineral also occurs in crystalline masses. It is very brittle, has a hardness of about 3 and is very heavy, its specific gravity ranging from 6.7 to 7.0. Its lustre is resinous to adamantine, and colors are various shades of yellow, orange, red, grayish or greenish. It is associated with other lead ores at many localities, as in Austria-Hungary, and New South Wales, but the United States localities are far more important. Magnificent specimens occur in the Red Cloud and Mammoth mines in Arizona, in the Organ Mountains, New Mexico, at Eureka, Nevada and Tecoma, Utah. It was named in honor of the Austrian mineralogist, Wulfen. It has been used to a limited extent as an ore of molybdenum.

Wulfstan, wulf'stan, Wulstan, or Wolstan, (1) Anglo-Saxon prelate: b. Long Itchington, Warwickshire, about 1007; d. Worcester 18 Jan. 1095. Educated at Evesham and Peterborough, he became a monk in the monastery of Worcester and in 1062 was consecrated bishop of Worcester. He was one of those who submitted to William the Conqueror at Berkhamstead in 1066, and was allowed to retain his see. The crypt of the present Worcester cathedral represents the church which Wulfstan caused to be erected between 1084 and 1089. He was a man of saintly character and loyal devotion to his work, and he is credited with having induced the merchants of Bristol to stop their traffic in slaves. He assisted in the Domesday survey, and led the defense of Worcester against the rebellious nobles commanded by Roger de Montgomery. He was buried in Worcester cathedral, and was canonized in 1203, his day being 19 January. Consult, 'Life,' by William of Malmesbury, 'De Gestibus Pontificum.' (2) Wulfstan: b. about 950; d. 1023. He was archbishop of York, and has been regarded as the author of 'Wulfstan's Homilies,' first printed in 1701. (3) Wulfstan of Winchester, a monk of the 9th century, who wrote metrical lives of St. Swithun and St. Ethelwold.

Wulff, vul'fēr, Richard Paul, German philologist: b. Frankfurt-on-the-Main 29 July 1845. He was educated in Berlin, Leipzig and Marburg and in 1875 was made professor of English at the University of Leipzig. He is the author of 'Das Evangelium Nikodem' (1872); 'Altenglisches Lesebuch' (1874-80); 'Kleinere angelsächsische Dichtung' (1882); 'Grundriss zur Geschichte der angelsächsischen Literatur' (1885); 'Geschichte der englischen Literatur von den ältesten Zeiten bis zur Gegenwart' (1896); 'Bibliothek der angelsächsischen Prosa' (1899).

Wundt, voont, Wilhelm Max, German physiologist and philosopher: b. Neckarau, Baden, 16 Aug. 1832. He was educated at Heidelberg, Tübingen and Berlin, and in 1855 became assistant professor of philosophy at Heidelberg. He was subsequently professor of philosophy at Zürich and in 1875 was appointed to a similar post at Leipzig. Among his numerous works are: 'Science of Muscular Motion' (1858); 'Manual of Human Physiology' (1864, 4th ed. 1878); 'Ethics' (1886, 2d ed. 1892); 'The Human and the Animal Soul' (2d ed. 1892, in English 1894); 'Logic' (1880-3, 2d ed. 1892-5); 'Elements of Physiological Psychology' (1874, 4th ed. 1893); 'System of Philosophy' (1880, 2d ed. 1897); 'Outline of Psychology' (1896, 2d ed. 1897, in English 1894); etc. As a physiologist he advanced psychology by his work, and as a philosopher introduced the inductive method into sciences previously purely speculative (for example, logic and ethics), and sought to advance psychology by exact measurements (as of the time needed by a nerve stimulation to reach consciousness and become a percept).

Wupper, woop'pēr, Germany, a river in the governments of Cologne and Düsseldorf of the Prussian province of the Rhine. It rises on the Westphalian frontier, and flows first northwest and then southwest, joining the Rhine between Cologne and Düsseldorf after a course of about 60 miles. It is not navigable for vessels of any size, but it provides considerable power for man-

ufacturing purposes. Its valley is the most populous in Germany, and contains the important industrial towns of Barmen, Elberfeld, and Solingen. In its upper course it is called the Wipper.

Wurdha, wūr'da, India. See **WARDHA**.

Wurmser, voorm'sēr, Dagobert Sigmund, COUNT VON, Austrian general: b. Alsace 22 Sept. 1724; d. Vienna 22 Aug. 1797. He served three years in the French army, but left it for the Austrian service, where he commanded a hussar regiment during the Seven Years' war, attaining the rank of major-general. During the Bavarian war of succession he commanded a special corps of the army in Bohemia, and after the peace was made commanding general in Galicia, and in 1767 general of cavalry. By the outbreak of the French Revolution his family lost their estates in Alsace. In May 1796, the critical condition of affairs in Italy after the defeat of Beaulieu led to the appointment of Wurmser to the command of the second Austrian army destined to act against Bonaparte. At the head of 60,000 men, he obliged the French to raise the siege of Mantua; but the defeat of his main body at Castiglione, Roveredo, and Bassano, rendered his situation extremely critical. He finally forced his way into Mantua, of which the blockade was resumed. A third Austrian army was sent into Italy, but the defeat of Arcole prevented it from relieving him; and at length, in February 1797, seeing the impossibility of any longer maintaining the defense, Wurmser surrendered Mantua to Napoleon.

Wuro'ra, India. See **WANORA**.

Württemberg, würt'tēm-bērg, or **Württemberg**, Germany, a southwestern state and kingdom of the empire, between Bavaria, Baden, Hohenzollern, and the Lake of Constance, which separates it from Switzerland; area, 7,528 square miles. It was formerly included in the territory of Swabia (q.v.). Except a few tracts in the south, the surface is hilly and even mountainous. In the west the Schwarzwald, or Black Forest, forms part of the boundary, and the Alb or Raube Alp, forming part of the Franco-German Jura, covers an extensive tract. The country belongs in large part to the basin of the Rhine, being drained northward into that river by the Neckar, while the Danube flows across the southern districts. A part of the Lake of Constance is also included in Württemberg. The climate is temperate. In the lower and more favorable districts the fig and melon ripen in the open air, and the vine, cultivated on an extensive scale, produces several first-class wines, maize, wheat, hops, tobacco, and fruit, which is employed in cider making, are largely cultivated. About a third of the country is under forests, which consist chiefly of oaks, beeches, and pine. Of minerals, the most valuable are iron and salt, both of which are worked by the government; the others are limestone, gypsum, alabaster, slate, mill-stones, and potter's-clay. The manufactures consist chiefly of cotton, woolen, and linen goods, paper, wooden clocks, toys, musical instruments, and chemical products. The government is a hereditary constitutional monarchy, the executive power being lodged in the sovereign, and the legislative jointly in the sovereign and a parliament, composed of an upper and a lower chamber. The latter, which is elected

every six years, is composed of 93 members. The yearly revenue from all sources is about \$17,500,000, and the public debt, the bulk of which was incurred in constructing the state railways, is about \$140,000,000. Württemberg is represented in the Bundesrath by 4 members, and in the Reichstag by 17. There is no exclusively established religion, but the king is invested by the constitution with the supreme direction and guardianship of the Evangelical Protestant Church. Education is generally diffused, and the centre of the educational system is the University of Tübingen. Besides Stuttgart (the capital), the chief towns are Ulm, Heilbronn, and Esslingen. The history of the state is of little general interest. Previous to the Napoleonic era the rulers had the title of duke, but in 1806, by the favor of Napoleon, the then duke gained a great accession of territory, as well as the title of king. In the subsequent arrangement of the European states by the Congress of Vienna the territorial accessions were confirmed and the kingly title formally recognized. In the war of 1866 Württemberg sided with Austria against Prussia. It became a member of the German Empire on its foundation in 1871. Pop. about 2,200,000, including nearly 120,000 Jews.

Wurts, John, American legal writer: b. Carbondale, Pa., 10 July 1855. He was educated at Yale and after traveling in Polynesia as a newspaper correspondent (1876-7) was graduated from the Yale Law School in 1884 and practised his profession in Jacksonville, Fla., 1884-96. He is now (1904) professor of the law of real property and equity at Yale, and has published 'The Anti-Slavery Movement with its Relation to the Federal Constitution' (1883); 'Washburn on Real Property' (1902); etc.

Wurts, vürts, Charles Adolphe, French chemist: b. Strasburg, 26 Nov. 1817; d. Paris 12 May 1884. He went to Paris in 1845, in 1851 became professor at the Agronomic Institute, Versailles, in 1853 was made professor of organic chemistry at the Sorbonne and professor of toxicology at the Ecole de Médecine. From 1866 to 1876 he was dean of the Sorbonne faculty of medicine. Among his numerous works on chemistry are: 'La théorie atomique' (1878); 'Leçons élémentaires de chimie moderne' (1868); 'Traité de chimie biologique' (1885). Consult: Friedel, 'Notice sur la vie et les travaux de C. A. Wurts' (1884).

Wurts, Henry, American chemist: b. Easton, Pa., 3 June 1838. He was graduated from Princeton in 1861, studied further at the Lawrence Scientific School of Harvard, was State chemist of New Jersey 1854-6, chemical examiner in the United States Patent Office 1869-61, and from 1871 to 1875 edited the 'American Gas Light Journal.' In 1880 he entered the employ of T. A. Edison (q.v.), as chemist, and has since made several important chemical discoveries, chief of which is that of the geometrical laws of the condensation of chemical modules.

Wurtzite, in mineralogy, a dimorphous form of zinc blende. Crystallization, hexagonal; hardness 3.5 to 4; specific gravity, 3.98; lustre, resinous; color, brownish black; streak, brown; composition, a sulphide of zinc; ZnS; occurrence, in a silver mine near Oruro, Bolivia, in Portugal, Peru, and near Butte City, Montana.

Wurzburger, wérz'bér-ger, Julius, American journalist: b. Baireuth, Germany, 1819; d. New York 14 Sept. 1876. The son of a merchant, he received a thorough education, and studied literature and history at the University of Erlangen. The year of revolution, 1848, found him editor of the Baireuth 'Tageblatt.' He then removed to Munich, where his ardent advocacy of the liberal movement attracted the attention of the ministry and he was banished in 1849 from Bavaria. Soon after Louis Napoleon had declared himself emperor, Wurzburger came to New York, and here established a connection with the *Staatszeitung* which continued from 1856 to 1875. As editor of its 'Sonntagsblatt' he exercised a wide influence.

Wushkum (from the name of their chief village), meaning a species of louse or flea, a tribe of the Chinookan stock of North American Indians. They call themselves *Tlaqluit*, and are the Echeloot of Lewis and Clark and the Wisham, Wishram, etc., of other writers. They occupy the north bank of Columbia River, Washington, from Tenino to the neighborhood of White Salmon River. They subsist largely on salmon, and are not reservation Indians, although they took part in the Yakima treaty of 1855. Their number is not known, but it is small.

Wyandot, English adaptation of the French *Ouendat* (*Wendat*), or *Houandate*, later written *Guyandotte*, the Huron name for themselves, signifying "They are islanders." A tribe composed of the remnants of several politically independent Iroquoian tribes and confederacies whose political integrity was destroyed by the Iroquois during the middle of the 17th century. Among these peoples may be mentioned the ancient *Wendat* (or *Houandate*), or *Huron* confederacy, which was composed of four tribes, namely, the *Attiguenongnahac*, the *Attignawantan*, the *Arendahronons* and the *Tohontacnrat* (for *Tohontakenrat*), and also, later, the affiliated tribes known as the *Ataonchronons* (*Ataonchronons*), the *Wenrôhronons*, and the *Atonthrathronons* (*Muskrat* people), the last being *Algonquian*; and the *Tionontateronons*, the *Attiouendaronk* (*Attiouendarankhronon*) or *Neuter Nation*, and lastly, the *Eries*. To the *Attiouendaronk* may be added the small affiliated tribes known as the *Aondironon* and the *Ongnarahronon* (*Ongmarahronon*). The first known habitat of these several peoples was south and east of Lakes Huron and Erie, in the present States of Ohio and Pennsylvania and western New York, in Ontario, Canada, and the northern shore of the St. Lawrence River as far down as the site of Quebec. To-day the Wyandots so-called live in the Indian Territory, where they number about 290; at Anderdon, Ontario, where the last report says two remain; and at Lorette, Quebec, Canada, where some Hurons who are in fact Wyandots, dwell, numbering about 458; the whole aggregating about 750. All these tribes when first encountered by Europeans were organized into well-governed communities. The social and political organizations were based strictly on blood kinship, real or fictitious. Fictitious kinship was obtained through the rites of adoption. These peoples dwell in lodges constructed of bark, which were long in figure, sometimes having as many as ten or twelve

fires with a family on two sides of each fire. The lodges were usually collocated into villages, many of which were quite strongly palisaded. For their sustenance they depended chiefly on agriculture, raising corn and beans of several varieties, squashes and sunflowers for oil. They tanned and dressed the hides of the animals which they killed. The prepared skins they neatly and skilfully utilized in the preparation of their raiment and their bedding. Reeds and barks of various kinds were useful in making mattresses and other needed articles. The title to their lands was vested solely in the mothers of the people. The choice of a candidate for chief for either of the two grades of this office was solely a prerogative of the mothers of the clan to which the chiefship belonged. The chief held his office during good behavior.

J. N. B. HAZRRT,
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Wyandotte, wí'an-dôt, Mich., city in Wayne County; on the Detroit River, and on the Grand Trunk, the Michigan Central, the Detroit Southern, and the Lake Shore & Michigan Southern R.R.'s; 12 miles south of Detroit. It has alkali works in which there are 1,200 employees; rug and fur coat factory, 300 employees; ship-building works, 500; baking soda and starch factory, 75; salt works, 300; and a number of other manufacturing establishments. The two banks have a combined capital of \$100,000; and the annual business is about \$900,000. There are 10 churches, a high school established in 1873, three public schools, four parish schools, and a public school library. The government is vested in a mayor and a council of six members elected annually in April. Wyandotte was settled before 1850 by Major John Biddle. It was platted in 1854, and in 1867 was incorporated. The government is administered under the commission plan. Pop. (1900) 5,183; (1910) 8,287.

J. D. HAVEN,
Editor Wyandotte Herald.

Wyandotte Cave, in Crawford County, Ind., a natural formation, second in size to Mammoth Cave (q.v.), but having a greater number and variety of stalactites and stalagmites than any other cave in the United States. It has been explored for a distance of 23 miles. The chambers and galleries are numerous, some about 350 feet long and 180 feet high. Some of the remarkable features are Monument Mountain, about 175 feet high, and 75 feet above its crests is the grand dome. The Pillared Place contains several clusters of stalactites, and the Pillar of the Constitution, a large stalagmite 30 feet high and 75 feet in circumference.

Wyant, wí'ant, Alexander Helwig, American artist: b. Port Washington, Tuscarawas County, Ohio, 11 Jan. 1836; d. New York 29 Nov. 1892. After trying the saddlery business, he turned to art, became a painter of landscapes at Cincinnati, exhibited in the National Academy of Design in 1865, was elected associate of the academy in 1868, and academician in 1869. In 1865 he went to Europe, becoming a pupil of Hans Gude at Karlsruhe. He attained high rank in landscape art, painting almost exclusively American scenes, and being particularly successful in views from the Adirondack wilderness. He was a founder of the American Water-Color Society. Among his works are: 'Scene on the

WYATT — WYCHERLEY

Upper Susquehanna (1869); 'Pool on the Available' (1871); 'In the Adirondacks'; 'A North Woods' Brook'; 'An Old Clearing'; 'Pool in the North Woods'; 'New Jersey Meadows' (1872); 'Sunset on the Prairie' (1876); 'Reminiscence of the Connecticut' (1878); 'Evening' (1885); 'Sunset, near Killarney' (1886); 'October Day' (1892). His chief characteristics are subtle tones, the evanescent moods of nature that he was quick and able to catch, and a delicate quality of workmanship.

Wyatt, wiat, James, English architect: b. Burton Constable, Staffordshire, 3 Aug. 1746; d. Marlborough, Wiltshire, 5 Sept. 1813. He was taken to Rome in 1760 by Sir William Bagot, and during the next six years studied architecture in that city and in Venice. Returning to London, he brought himself into notice by his designs for the Pantheon, in Oxford street, a building for many years famous as the rendezvous of the fashionable world. He received innumerable commissions for private residences in all parts of the kingdom; but his designs, for the most part in a sort of Græco-Italian style, have little at the present day to recommend them. About 1782 he turned his attention to Gothic architecture, being one of the first to attempt its revival; and for many years was employed as a restorer of cathedrals and parish churches, in the course of these labors making sad havoc at Salisbury, Hereford, Durham, and elsewhere. It must be said, however, that his imperfect conceptions of Gothic art were shared by his contemporaries and approved by the taste of his time, in large measure. His most famous work in this style was Fonthill abbey, erected for Beckford in 1795. He held the position of surveyor-general subsequent to 1796, and in 1802-3 was president of the Royal Academy.

Wyatt, sm Matthew Digby, English architect and art writer: b. Rowde, near Devizes, Wiltshire, 1820; d. London 21 May 1877. He made a diligent study of the architecture of Italy, France, and Germany, returning to England in 1846 to publish his 'Geometrical Mosaics of the Middle Ages' (1848). In 1856 he was appointed architect to the East India Company, and made many important designs for public works in Great Britain and India; in 1866 was awarded the royal gold medal of the Royal Institute of British Architects; and in 1869 was knighted and made Slade professor of fine arts at Cambridge. His chief books are: 'Metal Work and its Artistic Design' (1852); 'Industrial Arts of the 19th Century' (1853); 'Art Treasures of the United Kingdom' (1857); 'Fine Art' (1870); 'Architect's Handbook in Spain' (1872).

Wyatt, Richard James, English sculptor: b. London 3 May 1795; d. Rome 29 May 1850. He entered the Royal Academy as a student, afterward worked for a time in the studio of Bosso in Paris, and ultimately completed his professional education under Canova at Rome. In the last city he took up his permanent residence from 1821, making only one brief visit to England in 1841. He is one of the best English sculptors in the delineation of poetical and classical subjects. Among his works are 'Penelope'; 'The Huntress'; and 'Flora,' besides several memorials.

Wyatt, sm Thomas, English poet: b. Kent about 1503; d. Sherborne, Dorsetshire, 11 Oct. 1542. He was graduated from Cambridge in 1518, may have studied at Oxford, and subsequently went on his travels to the Continent. After his return to England he appeared at court, where the reputation he had already acquired as a wit and a poet introduced him to the notice of Henry VIII., who retained him about his person and knighted him in 1537. He was employed on several diplomatic missions to different powers, and was a friend of Thomas Cromwell (q.v.), in whose fall he ran some risk of being involved. In 1542 he was returned to Parliament as knight of the shire for Kent. A close student of foreign literature, Wyatt introduced the sonnet into England from Italy. In this he is commonly associated with Henry Howard, Earl of Surrey, but is more correctly to be regarded as the pioneer (see SURREY, EARL OF). None of Wyatt's verse, sacred or secular, appeared in his lifetime. Some of the secular poems were printed (96 are assigned to Wyatt) in the 'Songs and Sonettes' (1557) of Richard Tottel, commonly known as 'Tottel's Miscellany.' There are among the extant works 31 sonnets, and satires in heroic couplets, imitated from Persius and Horace. Wyatt's poems evince more elegance of thought than imagination, while his mode of expression is far more artificial and labored than that of Surrey. Consult Nott's edition of Wyatt and Surrey with the elaborate memoir prefixed thereto (1816); also the article by Churton Collins in T. H. Ward's 'English Poets' (1883), and Simond's 'Sir Thomas Wyatt and his Poems' (1889).

Wyattville, wi'at-vil, sm Jeffrey, English architect, nephew of James Wyatt (q.v.): b. Burton-on-Trent 3 Aug. 1766; d. London 18 Feb. 1840. He designed and superintended the alterations in Windsor Castle, begun in 1824, and his name was changed from Wyatt to Wyattville on the occasion of his being knighted in 1828.

Wycherley, wich'er-li, William, English wit and dramatist: b. Clive, Shropshire, about 1640; d. London 1 Jan. 1716. About 1655 he went to France for his education, but he returned to England a short time before the Restoration, and was entered a gentleman commoner of Queen's College, Oxford, which he left without a degree, and took chambers in the Middle Temple. He paid, however, little attention to the law, but became a man of fashion in the town, and made himself known as author of 'Love in a Wood, or St. James's Park,' a comedy, published about the end of 1671. This piece brought him into much notice, and his popularity was increased by comedies that soon after followed: 'The Gentleman Dancing-master,' published in 1673; 'The Country Wife,' produced in 1672 or 1673, and 'The Plain Dealer,' 1674. He became a favorite of the meretricious Duchess of Cleveland, and was much regarded by Villiers, the witty and profligate Duke of Buckingham. About 1680 he improved his circumstances by marrying the Countess of Drogheda, a young, rich, and beautiful widow. At her death soon after she settled her fortune upon him; but, his title being disputed, the costs of law and other encumbrances produced embarrassment, which ended in arrest. He re-

ained in confinement seven years, until released by James II., who, it is said, was so pleased with his comedy of 'The Plain Dealer' that he ordered his debts to be paid, and added a pension of £200 per annum, which he lost at the revolution. The succession to his father's estate, which was strictly entailed, does not appear to have relieved him from the embarrassments into which he had again fallen, and from which he found a deliverance only a few days before his death in marrying a young woman with a fortune of £1,500. Besides the plays already mentioned he wrote poems of no value or interest. His plays are excessively licentious. He was a friend of Dryden, and in his later years of Pope, but Pope's statements regarding their connection are not much to be depended on. Among latest editions of his plays is that by W. C. Ward (1893).

Wyckoff, wī'kōf, Walter Augustus, American sociologist: b. Mainpuri, India, 12 April 1865. He was graduated from Princeton in 1888, and after further study in Europe began in July 1891, the life of a day laborer, working his way from Connecticut to California and spending 18 months in this manner. His aim was to study from the inside the economic conditions surrounding American wage-earners, and the immediate outcome of his experiment was his three sociological works: 'The Workers—the East' (1897); 'The Workers—the West' (1898); 'A Day with a Tramp and Other Days' (1901). In 1893-4 he went around the world twice as a private tutor, in 1895 was made a lecturer on political science at Princeton, and in 1898 became an assistant professor of political economy there. He died 15 May 1908.

Wyckoff, wī'kōf. See **WICKLIFF, JOHN**.

Wye, wī, a river partly in Wales, partly in England, with its source in Plynlimmon, Montgomeryshire. After a circuitous and winding course of about 130 miles, having passed through Radnorshire, Herefordshire, and separated Monmouth from Gloucestershire, it falls into the Severn below Chepstow. It is distinguished for the beauty and variety of its scenery, especially in the neighborhood of Tintern Abbey. The tide at Chepstow sometimes rises 46 feet. Large vessels cannot ascend beyond Chepstow Bridge, but barges of from 18 to 30 tons reach Hereford. Other towns on the river are Monmouth, Ross, and Builth.

Wyeth, wī'ēth, John Allen, American surgeon: b. Marshall County, Ala., 26 May 1845. During the Civil War he served as a private in the Confederate army, was taken prisoner and held for 15 months. In 1869 he was graduated in medicine at the University of Louisville, and in 1873 from the Bellevue Medical College, where he was assistant demonstrator in anatomy 1873-4. He was surgeon to the Mount Sinai Hospital 1880-97, and in 1882 founded the New York Polyclinic Medical School, the first American post-graduate medical school. He has published 'Essays on Surgical Anatomy and Surgery'; 'Text Book on Surgery' (1888); 'Life of General Nathan Bedford Forrest' (1899); etc.

Wykeham, wī'kēm, William of. See **WILLIAM OF WYKEHAM**.

Wylla, wī'l, Robert, American artist: b. Isle of Man 1839; d. Pont Aven, Brittany,

France, 1877. He was brought to this country when a child, and after some study in the Pennsylvania Academy was sent by his trustees to study in France in 1863. Settling at the village of Pont Aven he was presently surrounded by a colony of artists. In the Paris Salon of 1872 he obtained a second-class medal, but not till after his death did his paintings attract much attention. His 'Death of a Vendean Chief' (1876) hangs in the Metropolitan Museum, New York.

Wyman, wī'mən, Jefferson, American anatomist: b. Chelmsford, Mass., 11 Aug. 1814; d. Bethlehem, N. H., 4 Sept. 1874. He was graduated from the Harvard Medical School in 1833, was professor of anatomy and physiology at Hampden-Sidney Medical College, Richmond, Va., 1843-7, and Hersey professor of anatomy at Harvard from 1847 till his death. He established there the Museum of Comparative Anatomy and for many years was indefatigable in efforts for its increase, was president of the Boston Society of Natural History 1856-70, became curator of the Peabody Museum, Cambridge, in 1866, and published many scientific papers. He was one of the earliest American supporters of the theory of evolution.

Wyman, Robert Harris, American naval officer: b. Portsmouth, N. H., 12 July 1822; d. Washington, D. C., 2 Dec. 1882. He entered the navy in 1837, and while attached to the Gulf Squadron during the Mexican War, took part in the siege and capture of Vera Cruz and the expeditions that captured Tusan and Tampico. He was stationed at the naval observatory in Washington in 1848-50 and 1853-4, and in the Civil War commanded the Yankee and Pawnee and the Potomac flotilla in 1861; and the Santiago de Cuba on blockading duty in 1862-4. He became commodore in 1872, and rear-admiral in 1876; and was commander-in-chief of the North Atlantic Station in 1879-82.

Wyman, Walter, American surgeon: b. St. Louis, Mo., 17 Aug. 1848. He was graduated at Amherst in 1870, and at the St. Louis Medical College in 1873; served in city hospitals 1873-5, and since 1876 has been in the Marine Hospital service, being made assistant surgeon in 1876, chief medical purveyor of the quarantine division in 1888, and supervising surgeon-general in 1891. He was an earnest advocate for the sanitation of ports not only in the United States, but in the West Indies and South America, holding that if this were enforced yellow fever would be entirely eradicated from the Western hemisphere. On his recommendation the government set apart a large tract of land at Fort Stanton, New Mexico, for a hospital whither all consumptive patients in the United States marine hospitals could be transferred.

Wynants, wī'nānts, or Wijants, Jan, Dutch painter: b. Haarlem between 1615 and 1620; d. about 1680. Very little is known of his life except that he was master of Adrian Vanderveelde, Wouwerman, and other eminent painters, and that he was naturally indolent and given to pleasure. His works are consequently few, but are highly valued for their technical merits. They consist of landscapes of small size, the figures and cattle in which were often executed by other hands.

WYNDHAM—WYOMING

Wyndham, win'dam, Sir Charles, English actor: b. 1841. He was at first educated for the medical profession, and coming to this country served for a time as surgeon in the United States army during the Civil War. Later he went upon the stage, appearing with John Wilkes Booth, and then, returning to England, made his debut in London in 1868 in light comedy. In 1876 he obtained control of the Criterion Theatre in London and in 1899 opened Wyndham's Theatre there. He was knighted in 1902. He has made several visits to this country on theatrical tours. Consult Scott, 'The Drama of Yesterday and To-day' (1899).

Wyndham, George, English cabinet officer: b. London 29 Aug. 1863. He was educated at Eton and Sandhurst Royal Military College. He served through the Suakim campaign and at Cyprus in 1885, and was private secretary to A. J. Balfour (q.v.) 1887-92. He also sat in Parliament for Dover from 1889, was parliamentary under-secretary of state for war 1898-1900, became chief secretary for Ireland in 1900 and entered the cabinet in 1902. In March 1903 he introduced the Irish land purchase bill subsequently passed. He has published an edition of 'North's Plutarch' in the 'Tudor Classics' (1894); and 'Shakespeare's Poems' (1898).

Wyndham, Sir William, English statesman: b. Orchard-Wyndham, Somerset, 1687; d. Wells, Somerset, 17 July 1740. He was educated at Oxford, and entering the House of Commons for his native county, identified himself with the Tories, became secretary at war in 1711, and in August 1713 was transferred to the office of chancellor of the exchequer. He was suspected of treasonable relations with the Pretender, and lost his office on the death of Queen Anne. On the outbreak of the rebellion in Scotland under the Earl of Mar in 1715, an order for Wyndham's confinement was issued, and he was arrested at his house in Somerset, but escaped. A reward of \$5,000 was offered for his apprehension. After lurking for some time in disguise he surrendered himself and was committed to the Tower. Released without a trial, he remained till his death a leader of the parliamentary opposition to the ministry of Sir Robert Walpole. He was a very graceful, clear, forcible, and spirited orator.

Wynne, win, Charles Whitworth. See CAYZER, CHARLES WILLIAM.

Wynne, Madeline Yale, American author, artist, and metal worker: b. Newport, N. Y., 25 Sept. 1847. She was a daughter of Linus Yale, inventor of the Yale lock; studied art in the Boston Art Museum, the Art Students' League, New York, and with George Fuller. She has published 'The Little Room and Other Stories.'

Wyntoun, win'ton, Andrew, Scottish rhyming chronicler: b. about 1350; d. after 1400. He was a canon regular of the priory of Saint Andrews, and was in 1395 prior of St. Serf's Inch, in Lochleven, probably holding this office till his death. Wyntoun's 'Orygynale Cronykil of Scotland' is the first historical record in the Scottish vernacular. It received little attention till 1795, when David MacPherson published an annotated edition of a part of it. David Laing edited a complete edition of this

work, 1872-9, and an edition from the Wemyss Manuscript has been prepared for the Scottish Text Society. Wyntoun's 'Chronicle' bears the usual character of the historical writings of the age in the indiscriminate mixture of tradition with history, but he appears to have been faithful to his authorities, whom he sometimes literally transcribes. Wyntoun's scholarship appears to have been considerable, and the candor and generosity with which he speaks of the enemies of his country, are commendable.

Wyoming (Indian, *Moughwewawmo*, meaning 'big plains'), a State of the United States, in the Rocky Mountain region, between the parallels lat. 41° and 45° N., and between lon. 104° 3' and 111° 3' W. It is bounded on the north by Montana, east by South Dakota and Nebraska, south by Colorado and Utah, and west by Utah and Idaho. The boundary lines are all straight. The greatest extent is from east to west, 355 miles; from north to south is 276 miles. Area, 97,800 square miles. Wyoming ranks sixth in size among the States of the Union.

Topography.—The elevation of the State averages from 5,000 to 7,000 feet above sea-level, and it is traversed by the main chains or spurs of the Rocky Mountain Range. From the plateau lands rise a number of lofty ranges and peaks, the summits of which are from 8,000 to nearly 14,000 feet above the sea. The largest mountain masses, or groups of mountains, are in the southeastern and northwestern parts of the State. In the northeast is the isolated group called the Black Hills, a portion of which extends into South Dakota. In the southwest and along the southern border are the Sierra Madre, spurs of the Uintah Mountains, several buttes, and a number of low mountain ranges. The chief ranges of the southeast are Medicine Bow, Laramie, Seminole, Rattlesnake, Sheep, and Snowy. The short ranges, Sheep and Snowy, extend northeast and southwest, but the other ranges of the southeast extend northwest and southeast. In the northwest part of the State the principal ranges are Shoshone, Teton, Snake River, Gros Ventre, Snow, and Owl Creek. In the northern part is a wedge-shaped group, broadest at the northern boundary, and ending abruptly about 100 miles south. The longest and most prominent range of this group is the Big Horn. Extending northwest and southeast across the western central part of the State are the Wind River and the Green Mountains. Some of the most prominent elevations in the State are Fremont, snow-capped all the year, and nearly 14,000 feet, Sheridan (13,691 feet), Atlantic (12,700 feet), Grand Teton (q.v.), Ferris, and Union. The Continental Divide crosses the State from the middle of the southern boundary to the northwestern corner, extending through the Yellowstone National Park (q.v.).

The principal plains are Laramie in the southeast, the Platte and Cheyenne plains in the east, which extend west to near the central part of the State; and Red Desert in the southwest. The great natural curiosity of the State is the region included in and adjacent to the Yellowstone Park. Numerous small parks and several passes have been found amid the mountains; just southeast of the National Park is the Two Ocean Pass, near which are the headwaters of streams whose waters find their

WYOMING

way to the Atlantic and Pacific oceans. (See **ROCKY MOUNTAINS**.)

Hydrography.—The State is noted for being the source of many of the head streams of the three great river systems of the United States: Mississippi, Columbia, and Colorado. The Yellowstone River (q.v.) and its tributaries, Big Horn, Powder, and smaller streams, drain the northern portion of the State and carry the waters to the Missouri. The Little Missouri, Platte, and Cheyenne are the chief rivers which drain the eastern portion, and which belong also to the Mississippi Basin. In the southwest is the Green River, a tributary of the Colorado. The west and northwest sections are drained chiefly by the Snake, or Shoshone, a branch of the Columbia. (In separate articles on the rivers which have their rise in this State descriptions are given of the cañons, cascades, and waterfalls.)

The largest lakes are the Yellowstone (q.v.), Jackson, and Shoshone, all in the northwest. There are many small lakes amid the mountains, bodies of clear water surrounded by wooded mountain regions of great beauty.

Geology.—The surface rock of several ranges, notably Wind River, Cheyenne, and Powder, is chiefly a cretaceous stratum. Eocene deposits are found in the southwest, lava and igneous rocks in the northwest, and crystalline rocks (Archean) on the crests of the mountains that cross the interior. Paleozoic and Lower Mesozoic strata appear in regular bands in the Wind River and adjacent ranges. Deep fissures and rugged sides are features of nearly all the mountains of the State. The lower slopes of the Laramie Range and a portion of the Laramie Plains are covered with the later Tertiary deposits. The geological formation of every age may be found in Wyoming, notably the tertiary, carboniferous, cretaceous, eozone, silurian, triassic, jurassic, Devonian, and volcanic. (See **ROCKY MOUNTAINS**.)

Minerals and Mining.—Wyoming has gold, silver, and most of the valuable minerals found in the Rocky Mountain region. In 1909 there were mined 184 ounces of fine gold, valued at \$3,800; 1,100 ounces of fine silver; 6,303,109 short tons of coal, \$9,896,848; clay products, \$67,755; sandstone, \$13,130; limestone, \$24,346. In 1902 the North American Copper Company began operations at Grand Encampment. The oil fields promise to be most productive. In 1909 the crude petroleum output of Wyoming and Utah was valued at \$36,648. On 1 Sept. 1903 oil was discovered near Evanston. A lubricating oil of superior quality has been found in the central part of the State. Thus far coal has been the chief product of the mines, and so much attention has been given to coal mining in this State that the quantities procured have steadily increased. In 1868 the entire quantity of coal mined was 6,925 short tons; it increased constantly until, in 1887, 1,170,318 tons were produced, in 1900, 3,837,392 short tons, valued at \$4,742,525. The output of the coal mines in 1907 amounted to \$10,883,003. In 1907 the State ranked 11th in the Union in coal production, with the counties of Sweetwater and Uinta taking the lead. The coal reserves are so enormous that they are likely to be among the most important factors in the development of the State in the future.

Climate.—The extremes of temperature

exist for a short period each year. The records show the maximum 116° above zero and the minimum 44° below zero, but those extremes are rare. The highest generally is 100° and the lowest 30° below zero. The mean temperature for January is 18.1° in the northern part of the State, and 25.1° for Cheyenne and vicinity. The mean temperature for July is 67° for the whole State. The extreme cold is not severe on account of the dryness. The greatest amount of rainfall is between March and June; the snowfall is light, and to insure crops in all the productive localities, except along the rivers, irrigation is necessary. The State is remarkably free from all conditions that tend to unhealthfulness, especially malaria and kindred diseases.

Soil.—The soil of nearly all the river valleys is a dark loam, and most fertile. On the higher lands and the lower mountain slopes there is a sandy loam, some of which is productive, as above stated, but irrigation is necessary. In the Red Desert of the southwest the saline deposits have rendered the soil almost unfit to support any but the lowest forms of vegetation. Greasewood and salt-sage are the chief forms of vegetation found here.



Flora and Forest Productions.—The vegetation common to the Rocky Mountain region is found here; the low shrubs, the grasses suitable for pasturage, on the foothills and lower slopes, fir, spruce, hemlock, pine, aspen, walnut, elm, ash, box-elder, red cedar, and along the streams, in places, cottonwood and willow. The wooded districts of the State cover only about 13 per cent of the entire area, or about 12,500 square miles. Of this timbered part of the State, 3,500 square miles are located within the boundaries of the Yellowstone National Park, and 5,207 square miles within the United States reserves. Yellow pine is found on the lower slopes of the Big Horn and Medicine Bow Mountains, and south of the Yellowstone Park. Considerable timber had been taken from the forest districts and has been found very valuable for many purposes. The timber manufactured into lumber, in 1900, was valued at \$831,558.

Fauna.—The animals found wild throughout the State are the black and the grizzly bear, wolf, prairie wolf, badger, wolverine, otter, porcupine, mink, civet, ermine, elk, deer, antelope, prairie dog, rabbit, and wild birds. (See **ROCKY MOUNTAIN FAUNA**; **AMERICA**; **UNITED STATES**.)

Agriculture and Stock Raising.—Crops cannot be raised without irrigation, except in small quantities along the streams, but with irrigation large crops have been produced. The most of the productive land is at a greater altitude than the fertile lands of any other State. This has a controlling effect upon the character of agriculture, the means used and the kind of productions. For a long time agricultural efforts were confined to grains and to sections where irrigation could be easily employed. This is still the case, in a great measure, but the quantity of land tilled has increased. There are about 8,125,000 acres of farm lands, of which 800,000 are cultivated for grains and vegetables. Grass grows in large portions of the State in fairly good quantities, particularly along the streams and where the lands are irrigated. Timothy and alfalfa are cultivated. It

WYOMING

SCALE OF MILES
0 10 20 30 40 50

Railroads
State Capitals shown thus: 
County Seats shown thus: 





1875

WYOMING

is estimated that nearly half the State is suitable for grazing. The native grasses cure naturally, standing on the ground without harvesting, on account of the dry climate. Near the arable lands there are streams that can be used for irrigation. One canal fed by the Big Sandy River irrigates 270,000 acres. The reports of the United States Geological Survey give as the number of acres that may be reclaimed by irrigation 15,000,000. In 1891 the number of acres that had been reclaimed was 2,172,000, but the amount of reclaimed acreage is increasing each year. In 1902 irrigation canals for 210,359 acres were begun. A supply of good water is furnished by the melting snows on the mountain tops. Thus are formed quite large streams, from which water is taken, in irrigating ditches, and distributed over the fields. There are irrigated lands in various parts of the State; but more than half lies in the valley of the North Platte River. Wheat, oats, hay, and potatoes are the principal crops; the climate is too cold for corn. Vegetables and some of the hardy small fruits are raised. The amount and value of the chief crops for 1902 were about as follows:

	Acres	Bushels	Value
Spring and Winter Wheat.....	65,000	2,675,000	\$2,542,000
Oats.....	230,000	4,160,000	2,080,000
Potatoes.....	11,000	1,100,000	902,000
Hay.....	300,000	720,000 tons	9,000,000

Northern Wyoming is a cattle and sheep raising section. The stock raised is of more value than the agricultural products. Great numbers of fine horses are raised, and many are sent each year to the markets in the Eastern States. Sheep are pastured on the mountain slopes in summer and on the plains in winter. In winter they subsist on the cured grasses; but sometimes the cold weather and snowstorms cause many to perish. Sheep raising in this State has increased greatly since 1900. The sheep are of a superior brand and the wool is an excellent quality. The number of stock in the State on 1 Jan. 1903 was as follows:

	Number	Value
Horses.....	113,444	\$3,282,736
Mules.....	1,481	78,292
Milk Cows.....	19,587	753,316
Sheep.....	5,828,158	14,306,693
Pigs.....	15,983	188,780
Other stock.....	796,060	18,533,928

In the amount and value of the wool product, in 1903, Wyoming ranked second, Montana being first.

Manufacturing.—The chief manufactured products are railroad cars and supplies, lumber and lumber products, harness, saddles, boots and shoes, clothing, flour, lime, brooms, cement, tobacco and malt products. In 1909 (government census) there were 266 manufacturing establishments, capitalized for \$5,840,000, and employing 2,811 persons. The total value of the products marketed was \$5,948,000. Manufacturing has increased but slowly from year to year, owing to the great distances from markets and centres of trade, and to the meagre transportation facilities. The manufacturing industries are limited mostly to the production of articles for local consumption.

Transportation.—The Union Pacific Railroad enters from the southeast and crosses the southern part of the State. Several short branches extend from the main line to different towns; three run from Cheyenne, one to the north and two toward the south. At Granger, in the southwest, the road branches, one line going northwest into Idaho, the other southwest into Utah. The Chicago, Burlington, and Quincy Railroad crosses the northeastern part of the State. A branch from the Northern Pacific Railroad extends from Livingston, in Montana, to Cinnabar, at the entrance to the Yellowstone Park. There are no railroads in the central or western part of the State, and the towns of the interior are connected only by stage routes. In 1901 there were 1,279 miles of railroad. The rivers within the State limits are not navigable for commercial purposes. The transportation facilities are entirely inadequate for the needs of so large a State or for the development of its natural resources. Wyoming has less miles of railroad than any other State except Nevada.

Militia.—In 1900 there were in the State, of militia-age, 32,988 men. In 1903 the organized militia numbered 526 men, of whom 43 were commissioned officers.

Banks and Finance.—The State has numerous and thrifty national banks, state, and private banks with a combined capital of over \$2,000,000. In 1890, when Wyoming became a State, a bonded debt was incurred, to the amount of \$320,000, for the capitol at Cheyenne and other public buildings. On 1 Jan. 1902 the debt had been reduced to \$280,000. The main sources of revenue are direct tax, land leases and sales, and fees. The total receipts for the fiscal year ending 30 Sept. 1910 was \$1,058,624; the expenditures, \$908,637. The debt is being reduced each year.

Charitable and Penal Institutions.—There is a State Board of Charities and Reform which has general oversight over and control of the charitable institutions of the State, with ample correctionary powers. Indoor relief has not been provided to any large extent, as it has not been required. There is an asylum at Cheyenne for the deaf, dumb, and blind, but it is used as a home for soldiers and sailors, on account of lack of occupants of the kind for which it was intended. The State Insane Asylum is located at Evanston, and a State hospital at Rock Springs. The penitentiary, first located at Laramie, has been moved to Rawlins. Saint Joseph's (R. C.) Hospital is at Laramie.

Education.—The education of all the children in a country so sparsely settled is very difficult, but the State has attempted to establish schools wherever five pupils can be found to attend. The school term is 89 days (1900). During the year 1900 there were 14,512 children enrolled as having attended school some portion of the year, out of a total enrolment of all persons between the ages of 5 and 18 in the State, which amounted to 19,744. The average attendance was 10,160. There were 524 public school buildings and 570 teachers, and eight Roman Catholic schools. The public school property was valued at \$453,607. In 1902 the schools of the State were University of Wyoming (q.v.) at Laramie, 10 public high schools, one private high school (Academy of

WYOMING

the Holy Child at Cheyenne), one State normal school at Laramie, one business college, at Cheyenne, and three private academies. The university was the only institution in the State which had power to confer degrees. The governing officials of the schools of the State are a State superintendent of schools, city superintendents at Cheyenne, Laramie, and Rock Springs, and a county superintendent in each county.

The requirements for a license to practise medicine in the State are successful examination or a diploma from a college which belongs to the American Association of Colleges or the Homoeopathic Institute, or the National Eclectic Medical Association, or any college of similar standing in a foreign country. To practise dentistry the requirement is a diploma from any dental college recognized by the National Association of Dental Examiners.

Each school district elects its own trustees. Teachers' institutes are provided by law; sessions of from 4 to 10 days are held annually. Discrimination as to pay of teachers on account of sex is forbidden. Children between the ages of 6 and 12 years must attend school 12 weeks in each year. Girls may not work in the mines; boys under 14 years of age may not work in the mines. Indian government schools have been established, and four private schools for the Indian boys and girls.

Government.—Under the State constitution both sexes are granted equal political rights and privileges, including the right to vote. All the State officers are elected for the term of four years and the treasurer is not eligible for reelection. The governor, secretary of state, auditor, treasurer, and superintendent of public instruction constitute the executive department. The salary of the governor is \$2,500; of each of the other officers \$2,000. The legislature holds biennial sessions, beginning on the second Tuesday of January of each odd year, and the term is 40 days. The legislature is composed of 23 senators and 30 members of the lower house. The salary of each member is five dollars a day and mileage. The capitol is at Cheyenne. The State has one representative and the usual two senators in the United States Congress.

Each one of the 23 counties has its own set of county officials.

Population.—The Federal Census of 1900 showed that Wyoming had, with one exception, the smallest population and the smallest density to the square mile of any State in the Union. The males numbered 58,184, the females 34,347. The foreign born numbered 17,415; Indians, 1,686; negroes, 940; Chinese, 401; Japanese, 393. The largest cities were Cheyenne, 11,320; Laramie, 8,237; Sheridan 8,408. State population (1880) 20,789, (1890) 60,705; (1900) 92,531; (1910) 145,965. B. ELLEN BUREA,

Editorial Staff, 'Encyclopedia Americana.'

History.—The stories of Spanish exploration have been much discussed, but the evidence is entirely inconclusive. The first white explorer of whom there is satisfactory record was the Chevalier de la Verendrye, a French-Canadian fur-trader who had settled on Lake Nepigon in 1728, and who, with a view toward developing commerce with the natives, passed 11 years of travel in the western wilderness.

He passed through Wyoming in 1743-4, on his return journey. According to the most authentic accounts, the first American to enter Wyoming was John Colter, who in 1807 discovered the Yellowstone region. The Wyoming section soon thereafter became the scene of the activities of American fur trappers and traders,—among them Capt. B. L. E. Bonneville, 7th U. S. infantry, whose adventures have been narrated in a well-known work by Washington Irving. The territory comprised within the present State belonged (with the exception of the southwestern corner—a portion of the territory ceded in 1848 by Mexico) to the Louisiana Purchase (1803). The first white settlement was at Fort Laramie, on the Laramie fork of the Platte, in 1834. This fort was purchased by the American Fur Company in 1835, rebuilt by the company in 1836, and sold by it to the United States government in 1849. For many years it was an important base of operations against the Indians. Fort Bridger was built on the Black fork of Green River in 1842, but abandoned in 1853. In 1842 Fremont visited Wyoming. Prior to 1866, all armed or migratory expeditions westward, including Gen. Connor's march along the "Bozeman trail" in 1865, had been in support of Mormon emigration, or to reach California and other opening fields of gold discovery. The inception of the Union Pacific Railroad developed new necessities for the occupation of regions farther north, only to be reached by the uncertain navigation of the upper Missouri. Gold discoveries in central Montana evolved the practical fact that neither river navigation, nor the diversion of overland travel from Ogden northward, at a sharp right angle, could furnish the required facility for reaching the new field of promise, but that a new road, following the Bozeman trail, around the Big Horn Mountains and up the Yellowstone Valley, would constitute a diagonal course which would shorten wagon travel by at least 300 miles. During the year 1865, the Harnay-Sanborn treaty guaranteed to Indians occupying that vast hunting region their undisturbed possession, provided they would not interrupt the building of the proposed railroad across the plains. All that upper region once belonged to the friendly Crow Indians, known as "Upsero-kas," or "Absarakas," belonging to "the land the crows fly over," or the "Land of the Crows," and this included the region watered by the Yellowstone, Big Horn, and Big Wind rivers. Northern Sioux, Arapahoes, and Cheyennes had gradually encroached upon these hunting grounds, and were hostile to white intrusion as well as to the Crow Indians themselves. These tribes, however, were summoned to meet a government commission at Laramie in May 1866, to decide upon what terms they would permit the building of a wagon road through that country and around the Big Horn Mountains to Montana. This proposition gained new promise from the fact that during the winter and early spring of 1865-6 hostilities along the lower Platte had almost ceased, and the Pawnees of Nebraska and Spotted Tail's Brulé Sioux were friendly to the whites.

In anticipation of successful negotiations, without conflict, Maj.-Gen. John Pope, commanding the Department of the Missouri, by general order 33, reorganized the department, upon the muster-out of volunteers who served

WYOMING

at the West during the Indian hostilities of the Civil War period, and formed five military districts, the "Minnesota," "Upper Missouri," "Platte," "Upper Arkansas," and the "Mountain District," the last named embracing the entire field desired for the new emigrant route to the Northwest. Army regiments were recruited as rapidly as possible to meet the new conditions. Col. Henry B. Carrington, of the 18th U. S. infantry, a three-battalion regiment, himself a brigadier-general, U. S. volunteers, from November 1862, and afterward brigadier-general, U. S. A., retired, who was then at Fort Kearney, Nebraska, in command of the East Sub-district of Nebraska, covering operations along the Platte River, and the upper forks of the Republican, was detailed to command the new Mountain District. His battalion, about 700 strong, started 19 May, reaching Laramie, 265 miles, on 15 June. Old Fort Connor, changed to Fort Reno, was to be rebuilt, and after another march of 65 miles, and passing Lake De Swedt, the location of Fort Phil Kearney, between the forks of Piney Creek, was surveyed and established 15 July. Later, 91 miles westward, Fort C. F. Smith was built upon the Big Horn River. An additional post on the upper Yellowstone was ordered, but never built, for want of troops. Col. Carrington, a practical engineer, prepared working plans for the building of Fort Phil Kearney, and in person superintended the erection of buildings, magazine, stockade, saw-mills, and all elements of a strong defensive post. Inspector-General Hazen pronounced it the "best on the continent, except one of the British Fur Company." Hostilities were immediate and constant. "During six months 51 hostile demonstrations were made, incurring a loss of 150 citizens and soldiers, and over 700 head of stock." On 8 Dec. 1866 President Johnson advised Congress that treaties had been effective and that peace reigned on the plains. But in a fight on 6 December Lieut. Bingham was killed, and a crisis was reached 21 Dec. 1866 when Capt. (brevet Lieut.-Col.) W. J. Petterson, accompanied by Capt. Frederick Brown and Lieut. George W. Grummond, and 78 men, were decoyed into an ambush and slaughtered. News of the tragedy reached Washington Christmas night. This disaster, so unexpected and complete, and so needless, if "the reinforcements and supplies repeatedly promised, but never furnished, had been received," shocked the whole country, and the first battalion of the 18th, and other troops, long idle at Fort Laramie, were hurried to save the feeble garrison that survived. Such a wholesale and barbarous massacre inspired friends of the new territory to give it a name memorable in the Indian history of Pennsylvania, irrespective of some fancied Indian meaning of the word Wyoming. Official reports at the time urged retention of the name in use by the Crow Indians, and as approved by James Bridger, the guide of the expedition, and an adopted Crow chief. During August 1867 Red Cloud again attacked a working party and was repulsed with great loss. But from lack of troops to sustain the line, Gen. Grant ordered the forts demolished. The original failure to support properly the first occupation delayed the peaceful settlement of the new territory until, after 10 years, another massacre, that of Gen. Custer (q.v.) and his command, compelled the government

efficiently to protect the frontier against the savage tribes of the Northwest.

The Territory of Wyoming was created by Congress 25 July 1868 from Utah, Idaho, and Dakota. The Territorial government was organized in 1869. A constitution adopted in November 1889 was approved by Congress, and the State was admitted to the Union 10 July 1890. In national politics the State has been Republican, save in 1896, when it went Democratic.

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HENRY B. CARRINGTON,
Brig.-Gen., U. S. V.; Col. U. S. A. (retired).

Wyoming, University of, located at Laramie, Wyo. It was chartered by the legislature of the Territory of Wyoming in 1886, and opened to students in 1889; the first State legislature in 1890 passed an act enlarging the scope of the University, and also made the State Agricultural College provided for by the national grants a part of the University organization. The State has since doubled its regular appropriation, and made several appropriations for special purposes. The University is open to women on equal terms; tuition is free except in the Department of Music. The educational policy of the University was liberal from the first; the preparatory and collegiate departments were the first established; the organization now includes (1) the Preparatory School; (2) the College of Liberal Arts; (3) the Graduate School; (4) the Normal School; (5) the College of Agriculture and the Agricultural Experiment Station; (6) the College of Mechanical Engineering; (7) the School of Mines; (8) the School of Commerce; (9) the School of Music. The College of Liberal Arts offers a classical, a literary, and a scientific course, and confers the degree of B.S. for the scientific course without Latin, and the degree of B.A. for all other courses. In each course the work of the Freshman year is required, the work of the Sophomore year partially elective, and the work of the Junior and Senior years almost entirely elective. The Graduate School affords opportunities for advanced study, the different departments offering suitable graduate courses. The master's degrees are conferred. The regular courses in Normal School, the College of Agriculture, the College of Mechanical Engineering, and the School of Mines are five years in length, including one preparatory year; the degree of B. Ed. is conferred for the completion of the normal course; the degree of B.S. for the agricultural, engineering and mining courses. There are also a one year's course in the Normal School, a course in domestic science, a one year's and a two years' agricultural course and a ranchmen's winter course in the College of Agriculture, and a winter course of six weeks in the School of Mines. The School of Commerce offers two two-year courses in bookkeeping and in stenography; the School of Music a seven-years' course in piano. Instruction in military

WYOMING VALLEY—WYTHE

science and tactics is also given. The University has organized a University Extension Association, which conducts extension lectures in all parts of the State; a Correspondence Teaching Department is also conducted, by which some of the work toward a degree may be done. The campus now occupied 40 acres in the eastern part of the city; the buildings are the Hall of Languages, the Mechanical Building, the Hall of Science, and the Gymnasium; the three first mentioned are built of gray sandstone, which is found near Laramie. The library in 1910 contained 28,000 volumes; the students numbered 244, of whom 108 were in the College of Liberal Arts, 50 in the Normal School, 20 in the School of Commerce, 30 in the College of Engineering, 15 in the School of Mines, 11 in the Graduate School, and 107 in the Preparatory Department.

The University of Wyoming, though in numbers one of the smallest of the State universities, is well equipped and maintains a high standard of scholarship, as the real head of the educational system of the State.

Wyoming Valley, a crescent-shaped valley in Luzerne County, Pa., traversed by the northern branch of the Susquehanna River; length 21 miles. It is a fertile alluvial plain, with rich deposits of anthracite coal, and is noted for its beautiful scenery. The valley was claimed by the colony of Connecticut as early as 1753, and was first settled by people from Connecticut; the ensuing dispute between Pennsylvania and Connecticut over this territory is known as the "Pennamite and Yankee war," and was not finally settled till after the Revolutionary War. (See *PENNSYLVANIA; History; Boundary Disputes*.) In 1782 a commission appointed by Congress decided in favor of Pennsylvania; an attempt was made to drive out the Connecticut settlers which led to a renewal of the war; but in 1788 Pennsylvania confirmed the titles of all actual settlers to their land, and all controversy was ended by 1800. During the Revolutionary War, a large proportion of the men of the Wyoming Valley joined the Continental Army; but a number of Tories were living in the valley; and in 1778, when they were joined by British troops and Indian allies, an attack was made upon the settlers who had taken refuge in Forty Fort near Wilkesbarre. The settlers did not number over 400, chiefly boys and old men; the British force, including the 700 Indians, was about 1,100. After a desperate battle fought on the 3d of July 1778, the settlers were completely defeated, about two thirds being killed. They were forced to capitulate, and after the surrender many of the prisoners were tortured and killed by the Indians. The greater part of the inhabitants of the valley were compelled to flee to other settlements, and endured great hardships. Consult Miner, 'History of Wyoming' (1845); Stone, 'Poetry and History of Wyoming' (1844); Peck, 'Wyoming: its History and Incidents' (1858).

Wyon, w'lon, William, English engraver and designer of coins and medals: b. Birmingham 1795; d. Brighton, Sussex, 20 Oct. 1851. Having won several prizes for medals offered by the society of arts, he went in 1816 to London, and was appointed second engraver at the mint, a post which he filled until the close of his life. In 1832 he was elected an associate of the Royal Academy, and in 1838 an academician,

being the first of his department who had ever obtained these honors. His works, comprising coins, pattern pieces of coins not used, medals, and seals, are numerous. His coins cover a period of nearly 30 years, including the latter part of the reign of George IV., the reign of William IV., and the first 13 years of the reign of Victoria. Far more numerous than these are his war, scientific, artistic, and testimonial medals, executed from his own or from Flaxman's designs, and in the highest style of art.

Wyss, vîs, Johann Rudolf, Swiss author: b. Bern 13 March 1781; d. there 31 March 1850. He was educated at various German universities, became professor of philosophy at Bern in 1806, and later also chief librarian. His 'Der Schweizerische Robinson' (1812-13), an imitation of Defoe, was translated into various languages, the first series appearing in English ('The Swiss Family Robinson') in 1820, the second in 1849. Wyss also wrote 'Vorlesungen über das Höchste Gut' (1811), and 'Idyllen und Erzählungen aus der Schweiz' (1815-22); and edited the collection 'Alpenrose' (1811-30).

Wythe, wîth, George, American patriot: b. 1726 in the county of Elizabeth City, Va., a short distance from Yorktown; d. Richmond, Va., 1806. One of his ancestors was George Keith (1639-1716), a Scotch Quaker, distinguished as a mathematician and Oriental scholar, who emigrated to America about 1684. On account of his radical religious views and his opposition to slavery, he was often imprisoned. On 15 Oct. 1693, Keith issued an 'Exhortation and Caution against buying or keeping Negroes,' seemingly the earliest Quaker protest against slavery. These views were inherited by George Wythe. From his mother, Wythe received a life-long bent toward classical scholarship. Even at the age of 80, he began to learn a new language. He was trained in the law by an uncle. Wythe's connection with the House of Burgesses, in Virginia, began on 27 Feb. 1752, on the eve of the French and Indian war. Hence he knew in a practical way the steps leading up to the Revolution, whose course he was destined to influence. He was a member of the Continental Congress, and one of the signers of the Declaration of Independence. He sat in the Philadelphia Convention of 1787 and exerted himself to secure the ratification of the Constitution by Virginia the following year. For ten years he was a member of Virginia's supreme court of appeals, and for above 20 years sole chancellor of the State. However important and varied were such positions that he filled, George Wythe is not to be judged chiefly as statesman or jurist. He was greatest as teacher, and his most lasting work was the subtle influence of his singularly pure and lofty character. Either in his law office or as professor in William and Mary College, he was the teacher of Thomas Jefferson, John Marshall, James Monroe, Henry Clay, and scores of other men only less prominent than these. With Jefferson, in particular, Wythe maintained a friendship and interchange of thought which had a bearing upon national concerns. So highly did Jefferson prize the work of Wythe as a teacher, that he exerted himself to establish, in 1779, in the College of William and Mary a chair of law, expressly for the occupancy of his "master

1. Mechanical Building and Science Hall University of Wyoming.
2. Hall of Languages, University of Wyoming.

WYTHEVILLE

and friend," as he delighted to call Wythe. Wythe was the first professor of law in the United States. William and Mary College was the second in the English-speaking world to have a chair of Municipal Law, George Wythe coming to such a professorship a few years after Sir William Blackstone. Jefferson, in writing from Paris in 1785 to Dr. Richard Price, an English opponent of slavery, gives striking evidence of his estimate of the services which Wythe was rendering to his country: "The College of William and Mary in Williamsburg, since the remodelling of its plan, is the place where are collected together all the young men (of Virginia) under preparation for public life. They are under the direction (most of them) of a Mr. Wythe, one of the most virtuous of characters, and whose sentiments on the subject of slavery are unequivocal." Henry Clay, in a letter of 3 May 1851, to B. B. Minor, says in reference to Wythe: "To no man was I more indebted, by his instructions, his advice, and his example, for the little intellectual improvement which I made, up to the period when, in my twenty-first year, I finally left the city of Richmond." "The most remarkable instance," says Munford, "of his genuine patriotism, to which I confess I am rendered most partial perhaps by my own experience of its effects, was his zeal for the education of youth. Harassed as he was with business; enveloped with perplexing papers, and intricate facts in chancery, he yet found time for many years to keep a private school for the instruction of a few young men at a time, always with very little, and often demanding no compensation." That Wythe conceived the training of publicists to be his true task appears from this sentence in a letter on 5 Dec. 1785, to John Adams: "A letter will meet me in Williamsburg, where I have again settled, assisting, as professor of law and police in the University there, to form such characters as may be fit to succeed those which have been ornamental and useful in the national councils of America." In three signal instances Wythe was a forerunner. As early as 1764, he wrote Virginia's first remonstrance to the House of Commons against the Stamp Act, taking so advanced a position in regard to that ominous Act as to alarm his fellow-burgesses. He was perhaps the first judge to lay down, in 1782, the cardinal principle that a court can annul a statute deemed repugnant to the Constitution, thus anticipating by a score of years the classic decision of his great pupil, John Marshall, in the case of *Marbury v. Madison*. He was an ardent advocate for the emancipation of the slaves, not only infusing his students with his abolition sentiment, but actually freeing his own slaves and making provision for them in his will. His death occurred in Richmond, Va., in 1806, from poison administered by his great-nephew, who hoped to come thus into the inheritance of his estate. "No man," says Jefferson, "ever left behind him a character more venerated than George Wythe. His virtue was of the purest kind; his integrity inflexible, and his justice exact; of warm patriotism, and devoted as he was to liberty and the natural and equal rights of men, he might truly be called the Cato of his country, without the avarice of the Roman; for a more disinterested person never lived. Temperance and regularity in all his

habits gave him general good health, and his unaffected modesty and suavity of manners endeared him to every one. He was of easy elocution, his language chaste, methodical in the arrangement of his matter, learned and logical in the use of it, and of great urbanity in debate. Not quick of apprehension, but with a little time profound in penetration, and sound in conclusion. His stature was of middle size, well formed and proportioned, and the features of his face manly, comely, and engaging. Such was George Wythe, the honor of his own and the model of future times."

S. C. MITCHELL,

President University of South Carolina.

Wytheville, with'vil, Va., town, county-seat of Wythe County; on the Norfolk & Western Railroad; 130 miles west of Lynchburg and 215 miles southwest of Richmond. It is in a stock-raising and mining region and has considerable lumbering interests. It has manufactories of iron works, woolen goods, and lumber products. The town has a county court-house, Trinity Hall Female College (Luth.), Wytheville Seminary (P.E.), Academy of the Visitation (R.C.), public elementary schools, and two libraries. The two state banks have a combined capital of \$100,000. Pop. (1890) 2,570; (1900) 3,003; (1910) 3,054.

Wytheville, Military Operations at.

During the Civil War the lead mines and works near Wytheville assumed much importance. On 13 July 1863 Col. John T. Toland, with the 2d West Virginia cavalry and 34th Ohio mounted infantry, about 800 men, started from Fayetteville, W. Va., to damage the lead works and destroy the railroad near Wytheville. On the evening of the 18th Toland arrived within five miles of the town and detaching two companies to destroy a railroad depot and track, 10 miles west, marched his remaining force into the town, which was defended by less than 200 men, under Maj. Bowyer, most of them distributed in houses and some in the streets supporting two guns. There was an obstinate fight in the streets, lasting an hour, when the town was taken and 8 or 10 of the best houses burned. The two guns and many small arms were captured and some prisoners taken, but all were abandoned when the return march was taken up next morning. The command reached Fayetteville on the 23d after a march of about 300 miles. The expedition had failed of its object, with the loss of 78 killed, wounded, and missing, of whom 17 were killed, including Col. Toland and two other officers. Col. Powell, commanding the 2d West Virginia cavalry, was severely wounded and captured. The Confederates report a loss of 6 killed and 12 wounded. On 2 May 1864 Gen. Crook started from Charleston on the Kanawha to destroy the Virginia and Tennessee Railroad and join Gen. Sigel in the Shenandoah Valley. One of his columns, of 2,600 cavalry, under Gen. Averell, was directed upon Saltville to destroy the salt-works, and then rejoin the main column under Crook at Dublin Station. After a very difficult march through the mountains and some sharp skirmishing Averell reached Taxewell Court House on the afternoon of the 8th, where he learned that Saltville was defended by earth-works and artillery, and was held in strength by Gen. W. B. Jones, upon which he abandoned

WYTTENBACH

the idea of attack and turned toward Wytheville, near which he arrived on the afternoon of the 10th and encountered Col. John H. Morgan, who had followed him from Saltville and by a detour first gained the town with a brigade and two battalions. A detachment of Morgan's command had been pushed out to a small gap in the mountain, through which alone Averell could approach the town from the road on which he was marching. The detachment was immediately attacked and Morgan marched to its assistance with all his command, and Averell fell back to a commanding ridge 800 yards from the gap. The contest continued four hours, or until nightfall, in a succession of attacks on the one side and retreats on the other, when Morgan fell back a short distance and Averell withdrew and next morning marched for Dublin, where he arrived in the evening and, resuming his march, joined Crook at Union on the 15th. Averell had 114 killed and wounded, and lost nearly 100 in prisoners. Morgan had 50 or 60 killed and wounded. When Gen. Stoneman made his raid into southwestern Virginia in December 1864 he captured Wytheville on the 16th, partially burned it, and next day sent a detachment to destroy the lead mines, which was done without loss. On Stoneman's second raid in southwest Virginia and western North Carolina in March 1865, Col. J. K. Miller, with 500 picked men of his cavalry brigade, captured Wytheville 6 April and destroyed the

depot of supplies at that point and the bridges over Reedy Creek and at Max Meadows. At Wytheville Miller was attacked by Confederate infantry and cavalry, but after hard fighting repulsed them, and withdrew with a loss of 35 killed, wounded, and missing, and rejoined the main column on its march for Salisbury, N. C.

E. A. CARMAN.

Wytenbach, vit'ten-bach, Daniel, Dutch scholar: b. Bern, Switzerland, 7 Aug. 1746; d. Osgeest, Holland, 17 Jan. 1820. He studied at Marburg, Göttingen, and Leyden; became professor of Greek at the Remonstrant Gymnasium at Amsterdam in 1771, of philosophy at the Athenæum in 1779, and succeeded in 1799 to Ruhnken's chair of rhetoric at Leyden. His greatest work is the edition of Plutarch's 'Morals,' with copious annotations and an admirable 'Greek Index to Plutarch's Works' (1795-1830). He retired in 1816, and died after some years of blindness. His 'Opuscula' appeared in 1820. Consult Mahne, 'Via D. Wytenbach' (1823).

Wytenbach, Johanna Gallien, Dutch writer: d. Leyden. She was married to D. Wytenbach (q.v.) when he was 72, and after her husband's death lived at Paris and was given the degree of doctor in philosophy by Marburg, in 1827. Among her writings were: 'Theagenes' (1815); 'Leontes' Banquet' (1812); and the romance 'Alexis' (1823).

X

X the twenty-fourth letter and nineteenth consonant of the English alphabet: it is a superfluous letter since it stands for no sound that cannot be signified by other letters.

When it occurs in the beginning of a word it is always pronounced in English as *s*: *Xenophon*, *senophon*, *siphoid*, *siphoid*; in the middle of a word it is usually equal to *ks*: *axis*, *aksis*, *Saxon*, *sakson*; but when in a word it ends a syllable, more especially an initial syllable, if the syllable following it is open or accented, the *x* has often the value of *gs*, as in *luxury*, *lugsurey*, *exhaust*, *egghaut*. Final *s* is always equal to *ks*. As an initial letter *s* does not occur in English save in words mostly technical and derived from Greek, and in a few words, mostly proper names, of Spanish origin.—The power of *x* in English, as in Latin, is that of the Greek letter *xi* (Ξξ), but its form is that appropriated in the Greek alphabet to the guttural aspirate *chi* (Χχ). Before the introduction of *x* (ξ) the Greeks represented the sound of *s* by Ξξ, ξs, and the Latins at first did the like, writing *Massumia*, *prossumus*; but as *s* had in their writing no function but that of representing, with *s* the sound of Greek *si*, the very sight of the *s*, even before the eye came to the *s*, raised in the mind the idea of a sibilant, and thus rendered the sibilant letter itself superfluous, and before long it was omitted and *s*, standing alone, represented the two characters *s* and *s*. In the popular pronunciation of Latin in the later period of the empire, *s* seems to have been sounded like *s* or *ss*: some inscriptions of that period have *visit* for *visit* and *miles* for *miles*. This change in the sound-value of *s* has persisted in the modern language of Italy in which *ss* or *s* is regularly substituted for the Latin *s*: *saxum* becomes *sasso*, *experimentum*, *experimento*, *maximus*, *massimo*, and so on. And in French, in words derived from Latin, the *s* occurring in the middle of a word is often changed to *ss*: *laxare* becomes *laisser*; or Latin *s* is changed to the sound of *sh*: *versare* becomes *facher*; and the word *sorsione* is pronounced *sorsione*. *X* hardly occurs in German words of native origin; its sound is usually represented in that language by *chs*, examples: *ochs* (ox), *works* (wax), *Sachse* (a Saxon).

X-Rays, or **Röntgen Rays**, a form of radiant energy originating in the highly-exhausted vacuum tubes of Crookes (see **VACUUM**), and resembling light in certain respects, though differing from it notably in many ways. The X-rays are propagated in straight lines, and are capable of affecting the sensitive plates that are employed in photography, so that

subsequent development will cause the affected portions to blacken, just as though the plate had been subjected to the action of light. The X-rays are practically invisible to the eye. They are capable, however, of exciting brilliant fluorescence in certain minerals, and their presence may, by this means, be made distinctly evident to the eye. The X-rays were discovered in 1895 by Professor Wilhelm Konrad Röntgen, of the University of Würzburg; the name being given by him to signify that the ultimate nature of the radiation was unknown, "X" being a letter that is commonly used in algebraic operations to represent an unknown quantity.

In the nearly-perfect vacuums employed by Crookes, the high-tension electrical discharge does not take place between the electrodes in the form of a spark, but, when the tension of the gas in the tube is sufficiently low, it assumes the form of a luminous streamer, proceeding across the tube from the negative electrode (or "cathode"), in a direction perpendicular to the surface of this electrode. The luminous shaft that proceeds outward from the cathode in this manner is called the "cathode ray," and it exhibits many interesting phenomena. (See **VACUUM**.) In a general way, it may be said to deport itself as though it were composed of a storm of tiny electrified projectiles, which are negatively charged by contact with the cathode, and are then violently repelled from the cathode in a direction perpendicular to its surface. Many experimenters have devoted their attention to the cathode ray, in the endeavor to discover its true nature; and among these experimenters was Lenard, a young German physicist, who was assistant to Dr. Heinrich Hertz, at Bonn, at the time of the latter's death in 1894. Lenard appears to have been impressed with the idea that it is possible to make the cathode ray emerge from the vacuum tube, into the air. It would seem that the projectile explanation offered above precludes any such possibility; but Lenard found that if the vacuum tube is provided with a very thin pane of aluminum foil at the place where the cathode ray strikes it, this ray can apparently pass through the aluminum so as to emerge into the air outside of the tube. In Lenard's apparatus the vacuum tube is entirely enclosed by opaque material, so that the light from the interior of the tube may not affect the eye; the thin pane of aluminum being placed, as indicated above, at the place where the cathode ray within the tube strikes the wall of the tube. When the proper precautions are taken against the escape of any ordinary light from the interior of the tube, the cathode ray, in a darkened room, can be seen to emerge from the tube through the

X-RAYS

aluminum, taking the form of a divergent and diffuse luminous brush, which, as Lenard showed, can be deflected by a magnet. Lenard also found that the emerging brush affects a photographic plate, and he investigated the relative transparencies (or opacities) of various substances for it. Röntgen repeated certain of the experiments of Crookes, Hittorff, Lenard, and others, and made the further discovery that vacuum tubes also generate another kind of radiant energy, which he called "X-rays," and which resemble the cathode ray in some respects, but differ from it in not being deflected by a magnet, and in not being distinctly visible to the eye. The X-rays and the cathode ray are both capable of exciting strong fluorescence in certain crystalline substances which are subjected to their influence; and in working with the X-rays it is customary to make use of fluorescent screens, which are coated with barium platinocyanide, or with calcium tungstate, or with some other substance in which the fluorescent effects of the X-rays are very pronounced. A screen of this kind, when exposed to the action of the X-rays, becomes luminous, and the intensity of the luminosity is proportional to the intensity of the radiation striking the screen. Thus when a screen of this kind is glowing with uniform brilliance, and an object (such as a piece of lead or glass) which is more or less opaque to the rays is interposed between the screen and the tube from which the X-rays proceed, the object so interposed shields the screen, over a certain area, from the exciting X-rays, so that a comparatively dark region is produced, as though the opaque object were casting a shadow. The relative opacities of various substances can be studied in this manner, by merely interposing the objects whose opacities are to be tested, and noting the depths of the apparent shadows that are produced. Glass is found to be much less transparent to the X-rays than an equal thickness of aluminum or of wood, and, in general, it may be said that the opacity of any substance is approximately proportional to the density of the substance. When a portion of the human body is interposed between the tube and the fluorescent screen, the bones, having a greater density than the flesh that surrounds them, cast shadows upon the screen, so that their images can be seen, dark, against a much lighter background. In comparatively thin parts of the anatomy, such as the hand, very good shadowgraphs can thus be had of the bones; but when the X-rays have to traverse thicker parts of the body, such as the chest, the shadowgraphs are far less distinct. The ribs can be seen through the entire body, though somewhat imperfectly, and the liver and heart can also be indistinctly perceived. Tumors and other morbid growths can likewise be traced to some extent, as well as tubercular areas in the lungs, and certain other pathological conditions. (The haziness of the images that are obtained when the X-rays traverse thick tissues is due, no doubt, to "secondary radiation," as explained below.) Owing to the great density of lead, bullets that are embedded in the flesh can frequently be located with considerable accuracy, and in the surgical treatment of bullet wounds the X-rays are therefore often highly useful.

Permanent images of the shadowgraphs that are produced by the X-rays can easily be had by substituting a sensitive photographic plate for

the fluorescent screen referred to above; the image being allowed to fall upon the photographic plate, which is afterwards developed in the usual manner.

There has been some controversy about the origin of the X-rays;—that is, about the part of the tube from which they emanate. Röntgen believed that they originate in the region where the cathode ray is stopped by the wall of the tube, or by some other obstacle; and although this view has been disputed by other experimenters, it is now believed to be correct. That is, when the cathode ray strikes against the glass wall of the containing tube, the X-rays appear to originate at this point on the wall, and when the tube is so constructed that the cathode ray strikes directly against the anode, then the X-rays proceed from the anode. It has been found, indeed, that the radiation is much more intense when the design of the tube is such as to cause the cathode ray to impinge directly upon the anode, and in most of the modern tubes for the production of X-rays this construction is adopted. It is observed that when an X-ray tube has been operated for a considerable time, the vacuum within it becomes more and more perfect, so that it is eventually difficult to force through the tube a discharge sufficient to generate the rays with the desired intensity. Moreover, the penetrative character of the X-rays given off by a tube appears to depend to a considerable extent upon the degree of perfection of the vacuum, as was observed by Röntgen himself. For these reasons, most of the X-ray tubes are made, at the present time, with regulable vacuums, the main tube being provided with a side bulb, with which it communicates by means of a tube. The glass walls of the auxiliary bulb become covered with a thin layer of condensed air (see *ANODIZATION*); and when, through the operation of the apparatus, the vacuum in the main tube has become so highly perfected that the discharge passes with difficulty, the walls of the auxiliary bulb are warmed by a gas flame or otherwise, so that a portion of the air that is held condensed upon them is driven off into the interior of the bulb, and thence into the main tube, until the vacuum becomes reduced sufficiently to permit of the satisfactory passage of the discharge.

The experimental investigation of the X-rays is beset with serious difficulties, because these rays possess properties so different from those of ordinary light that few of the methods that are employed for the study of light can be applied to them. For example, the X-rays cannot be refracted, and they are apparently not capable of regular reflection. Hence they cannot be focused in any way. Furthermore, they cannot be made to exhibit diffraction, interference, or polarization. Many of the methods employed in the study of light are based upon one or more of these phenomena; and hence, the phenomena themselves being absent in the case of the X-rays, little or no help in the investigation of this form of radiation can be had from our previous experience with light.

When the X-rays traverse a solid which is more or less transparent to them, the distinctness of the shadow-like images that are seen upon the fluorescent screen, or which are recorded upon the photographic plate, diminishes with the thickness of the object through which the rays pass. The images become diffuse with

X-RAYS

increasing thickness in such a way as to suggest that the X-rays do not really travel in straight lines, but that they are capable of bending about an obstacle so as to influence the screen, or the sensitive plate, behind the obstacle. A more careful study of the phenomenon indicates, however, that the diffuseness of the image under these circumstances is due to the fact that each particle in the course of the X-rays acts as a centre of "secondary radiation," from which X-rays again emanate, though with reduced intensity, in all directions. The passage of X-rays through a body may therefore be compared with the passage of ordinary light through a light mist, each particle of the mist acting, in a similar manner, partly as a mere obstacle, and partly as a new centre of radiation, so that the shadows that are observed in such a case are diffuse and indefinite.

The discovery of the X-rays led to much speculation among physicists as to their ultimate physical nature. In the theory of light it was long ago pointed out that the disturbance which takes place in the ether when a light-wave travels through that medium must be such that the displacements that occur, whatever their nature may be, occur only in directions that are perpendicular to the direction in which the ray itself progresses. (See *ETHER; UNDULATORY THEORY*.) There appeared to be no phenomenon whose existence corresponded to the existence of a wave of compression and rarefaction in the ether, such as occurs in air when a sound-wave passes; and in order to explain the absence of this longitudinal wave of rarefaction and compression it was necessary, in the elastic-solid theory of light, to assume that the ether is absolutely incompressible, or to make certain other special assumptions with respect to its nature. Upon the discovery of the X-rays, it was therefore natural to inquire if they do not constitute the missing phenomenon corresponding to a compressive disturbance in the ether. This idea, although it was an attractive one, and agreed well with the absence of polarization in the X-rays, gradually fell out of favor, giving way temporarily to the hypothesis that the X-rays are similar in nature to ordinary light, but that they are of exceedingly short wave-length—much shorter, in fact, than any form of radiation previously known. There was much to be said in favor of this latter hypothesis, for it was known that the phenomena that would be manifested by light of wave-lengths exceedingly short in comparison with the average distances between the molecules of transparent bodies would be very different from those that are observed in connection with light of longer wave-lengths. Even if the wave-length of the X-rays were very short, however, it would be natural to expect that interference phenomena of some sort might still be observable; and yet no such phenomena could be detected. What is probably the true explanation of the nature of the X-rays was given almost simultaneously by Stokes, Lehmann, and J. J. Thomson. The "pulsation theory" advanced by these physicists assumes that the X-rays do not, like light, consist of trains of waves, in which a series of similar waves follow one another in rapid succession and at regular intervals, but that they consist, instead, of a series of electrical pulsations through the ether, following one another without any regularity. A mathematical analysis of the conse-

quences of this theory indicates that it is in entire harmony with the observed absence of refraction, reflection, polarization, interference, and diffraction. The cathode ray within the vacuum tube is believed to consist of a storm of tiny molecular fragments, or electrons (q.v.), the velocities of which may be as great as 40,000 miles per second. When one of these charged particles comes in contact with a solid wall or other obstacle, the abrupt change that is produced in its motion causes a violent alteration in the electrical stress that exists in the ether immediately about the point of collision, and the result is, that this point of collision serves as a centre from which a pulsation of electrical disturbance radiates outward. A fresh pulsation will therefore be produced every time a charged electron collides with the solid obstacle, and hence, since there is no regularity in the collisions, there will also be no regularity in the resulting ethereal pulsations. This view of the nature of the X-rays accords with all the known phenomena, even with the demonstrated absence of the X-rays from ordinary sunlight. This last fact was tested and verified by experiments upon Pike's Peak where a sensitive photographic plate was exposed for several months to the action of the sunlight, protected by wrappings that were impervious to light, but which would transmit, freely, any X-rays that might happen to be present. The elevated position was selected in order that any absorptive action that the earth's atmosphere might exert upon the rays should be reduced to the smallest practicable amount. Subsequent development of the exposed plate showed no evidence of the action of X-rays upon it.

In the course of experiments with the X-rays, it was soon found that they are capable of producing more or less marked physiological effects. The most noticeable of these consists in the "burning" of the skin, the cuticle becoming reddened and inflamed under protracted exposure to these rays, much as it does upon exposure to strong sunlight. It was also found that the human eye can perceive the X-rays faintly, though it is believed that the retina is not directly affected by them; the sensation of a faint, indefinite light to which they give rise being probably due to the fluorescing of some of the inner parts of the eye under their influence. The known fact that the artificial culture of tuberculosis germs must be conducted in the dark, and that strong sunlight will check the development of such germs, or destroy them altogether, led to the hope that the X-rays might have similar properties, and that on account of their marked power of penetrating the human flesh, they might be useful in the treatment of tuberculous disease. These hopes were not very fully rewarded, but the X-rays have nevertheless proved valuable in the treatment of superficial tuberculosis (lupus) and cancer. Some authorities still hold that the cases of apparent cancer which have been successfully treated by the X-rays have not been correctly diagnosed, and that true carcinoma does not yield permanently to the action of this agency. See *ETHER; ELASTICITY; LIGHT; RADIOACTIVITY; VACUUM*. Consult, also, Barker, 'Röntgen Rays,' in the 'Scientific Memoir Series,' where several of the most important of the papers that have appeared are collected. A. D. RISTEN, PH D.

Editorial Staff, 'Encyclopædia Americana.'

X. Y. Z. CORRESPONDENCE — XANTHOXYLUM

X. Y. Z. Correspondence, in United States history, the name given to the despatches of the three commissioners to France in 1797-8, Marshall, Pinckney, and Gerry. These commissioners reached Paris in October 1797, but were refused recognition by the Directory. They were, however, notified by the secretary of the Marquis de Talleyrand, minister for foreign affairs, that agents would be sent to conclude negotiations. The first of these, Hottinguer, stated that a "loan" of \$1,200,000 would be the necessary means of placating the Directory: the other two, Bellamy and Hauteval, urged that in case the American government would buy at par stock amounting to 32,000,000 livres, but whose market-value was really about one half that amount, the transaction would be viewed as a loan. The intimation was that in default of money war would ensue. These terms were promptly rejected. The despatches sent by the commissioners were submitted in copy to Congress, X., Y., and Z., having been substituted for the respective names of the French agents. A great stir was caused at the time. Preparations for hostilities were made, and war on the sea actually broke out. Consult for the text of the correspondence 'American State Papers, Foreign Relations,' Vol. II. (1832).

Xanthian (zân'thî-an) Marbles, a large collection of marbles of various ages (from 545 a.c. onward) discovered near Xanthus, in 1838.

Xanthine, an organic base, $C_5H_4N_4O_6$, occurring in small amounts in many animal secretions, in the blood, urine, liver, in some urinary calculi, and in tea extract. It may be readily made by the action of nitrous acid on guanine. A white amorphous powder slightly soluble in water, and forming crystalline compounds with both acids and bases. It is closely related to theobromine and caffeine, the alkaloids found in cocoa and coffee respectively. Caffeine may be considered as xanthine in which three hydrogen atoms have been replaced by three methyl (CH_3) groups.

Xanthippe, zân-thîp'ê, the wife of Socrates, the Greek philosopher. Her shrewish temper has become proverbial, but many of the stories about her are probably false, for in ancient Athens gossip was cultivated to the perfection of a fine art, the point and not the truth of the story being the chief consideration. Xanthippe's natural inequalities of temper were heightened by the peculiarities of her spouse, especially his indifference to the commonplace duty laid on the head of the house to make both ends meet. The philosopher received her reproaches with such good-humored indifference that it is not surprising she sometimes resorted to other weapons beside her tongue; as on the occasion when she is said to have finished up a tirade by sousing the philosopher, though his remark, as he moved dripping from the scene, that when Xanthippe thundered she watered, must have shown her that here, too, she was powerless.

Xanthippus, zân-thîp'ûs, Spartan general. He assisted the Carthaginians in the first Punic war and defeated the Romans under Regulus at Tunes (now Tunis) 255 a.c.

Xanthos, zân'thòs, the mythical horse of the mythical hero, Achilles. It is related in the 'Iliad' that being chided by his master for

leaving Patroclus on the field of battle, the horse turned his head reproachfully, and told Achilles that he also would soon be numbered with the dead, not from any fault of his horse, but by the decree of inexorable destiny.

Xanthos of Lydia, Greek historian. He flourished about the 6th century a.c., and was contemporary with Herodotus. He wrote a work called 'Lydiaca,' a history of Lydia onward from heroic times, giving also a geographical description of the country. Only fragments of it have been preserved.

Xanthoxylum, a genus of the *Rutaceae*, composed of erect or climbing shrubs, or trees, often with prickly branches. The leaves are compound, pinnate, sometimes reduced to three, or rarely, to one, leaflet, usually pellucid dotted. The flowers are small, in axillary or terminal panicles, and are from 3- to 5-merous. The fruits split in two, with one or two shining black seeds. *Xanthoxylum* is a large genus, found both in the Eastern and Western hemispheres, especially in their warmer parts. The species are so aromatic and pungent that in the countries where they exist they are popularly called peppers, specially *X. piperitum*, called Japan pepper, which is regarded as an antidote for poison. *X. rhetsu*, an Indian species, has small yellow flowers and small round berries, which, when unripe, taste like the skin of a fresh orange. Its fruit, and the seeds and bark of *X. alatum*, which grows near the base of the Himalayas, and those of *X. budranga*, also Indian, are given as aromatic tonics in fever, diarrhoea, dysentery, and cholera. They are used as a condiment in India and as a fish-poison. The small branches are employed to make walking-sticks, and the twigs as tooth-brushes. The seeds of the latter are as fragrant as lemon peel; *X. clava* and *X. fraxineum* applied externally to the gums or taken internally, are powerful sudorifics and diaphoretics used in toothache, paralysis of the muscles of the mouth, and rheumatism. The root of *X. nitidum* is sudorific, emmenagogue, etc. The powdered bark of *X. himala* is given in Brazil in carache; and the capsules and seeds of *X. hastile* are employed in northern India to intoxicate fish. The West Indian species of *Xanthoxylum* are called yellow-wood, *X. caribæum* being differentiated as the prickly yellow-wood. It is a tree, 20 to 50 feet high, whose prickly young stems are made into walking-sticks. The wood is used for inlaying and for furniture. *X. crissasum* is the satin-wood of Florida and the West Indies, which when first cut has the odor of the veritable satin-wood *X. fagara* (*Pterota*) is a small tree common in the same region, and tropical America, producing a hard, heavy, reddish-brown wood known as savin or iron-wood in the West Indies, or as the wild-lime. Still another species is *X. emarginatum*, a shrub with coriaceous foliage, exported under the name of rose-wood, but is called licca-tree or lignum-vorum at home. The commonest species of the northern United States, and the hardiest, is the *X. Americanum*, a shrub or small tree, with odd-pinnate leaves, and twigs which are generally prickly. The cymose flowers are axillary and sessile, without calyx, and they are greenish-white. The capsules are black and ellipsoidal. It is called prickly-ash or toothache-tree, because both Indians and country people used the

XANTHUS — XENOPHANES

hot, acrid bark of both this species and *X. clava-herculis*, which when chewed produces a stinging sensation, for aching teeth. The bark of both these species, and the capsules of the latter, are a powerful stimulant and tonic drug. The southern prickly ash is *X. clava-herculis*, the sea-ash, or pepper-wood, has its flowers in large terminal compound cymes, and its prickles are supported on corky cushions.

Xanthus, zán'thūs, Asia Minor, (1) an ancient city, the capital of Lycia, on the Xanthus River; about eight miles above its mouth. Its ruins near modern Gunik were discovered in 1838, and have yielded a large collection of marbles, now in the British Museum. (2) The river now known as the Kedja Ak rises in Mount Taurus, and falls into the Mediterranean a little to the west of Patara.

Xave'rian Brothers. See **ORDERS, RELIGIOUS.**

Xavier, zăv'î-ér, Sp. hă-vé-ăr', **Saint Francis.** See **FRANCIS XAVIER, SAINT.**

Xavier, Henry, American horticulturist: b. Lyons, France, 26 March 1826; d. Mount Vernon, N. Y., 19 June 1901. When quite young he came to this country and in 1853 settled at Mount Vernon. He imported into the United States nearly every known species of wine-producing grape vines, making many trips to Europe for this purpose, and bringing the vines from France, Spain, Italy, Germany, and Hungary.

Xavier, Jerome, Spanish Jesuit missionary: b. Navarre; d. Goa, India, 1617. He wrote both in Latin and in Persian, and among his principal works are: 'Treatise on the Mysteries of Christianity' (1600); 'Life of the Apostles'; 'History of Jesus Christ'; 'Directory of Kings for the Government of their Subjects.'

Xebec, zē'bēk, a small three-masted vessel, employed in the Mediterranean, distinguished from other European vessels by the great projection of the prow and stern beyond the cut-water and stern-post. In this respect it resembles the felucca, from which it differs only in having the fore-mast square-rigged. The xebec is constructed with a narrow floor for the sake of speed, and of a great breadth, so as to be able to carry a considerable force of sail without danger of overturning.

Xenia, zē'nî-ā, Ohio, city, county-seat of Greene County; on the Shawnee Creek, and on the Pennsylvania, the St. Louis, the Cincinnati, Hamilton & Dayton, and the Pittsburg, Cincinnati, Hamilton & Dayton R.R.'s; 55 miles southwest of Columbus. It is in the Little Miami Valley, in the midst of a productive farming region. It is well laid out and has good macadamized streets and enough of slope to have surface drainage. The chief manufacturing establishments are two shoe factories, one powder works, one ice factory, flour mill, four twine factories, cigar factory, two machine shops, one automobile factory, brewery, one daily paper house. In 1900 (government census) Xenia had 106 manufacturing establishments, capitalized for \$1,819,614 and employing 1,105 wage-earners to whom were paid annually \$394,386. The total cost, annually, for raw material, rent, fuel, etc., was \$2,171,360; and the value of the finished products was \$3,122,797. The county court-house is in a park in the centre of the

city. Other prominent buildings are the municipal building, the Ohio Soldiers' and Sailors' Orphans Home, and several business blocks. Outside the city limits are the county infirmary and children's home.

The educational institutions are Xenia Theological Seminary (United Presbyterian), opened in 1794, three high schools; Central, established in 1856, East Main Street, for colored pupils, and the Ohio Soldiers' and Sailors' Home High School; public and parish schools, a public library (building presented by Andrew Carnegie), and school libraries. Wilberforce University, in Wilberforce suburb, is for colored pupils. It has departments of law, theology, science, and literature, and a training school for nurses. There are 16 churches: Five Baptist, three Methodist, three Presbyterian, and one each of Roman Catholic, Disciples of Christ, Protestant Episcopal, Lutheran, and Reformed. The two banks have a combined capital of \$200,000, and total resources about \$1,300,000. The government is vested in a mayor, boards of public service and safety, and a council of seven members, elected biennially.

Xenia was settled in April 1803 by John Marshall. In 1808 it was incorporated. Pop. (1890) 7,301; (1900) 8,696; (1910) 8,706.

J. F. CHASE,
Editor 'Xenia Gazette.'

Xenocles, zēn'ō-klēz, Greek tragic poet: b. Athens 4th century B.C., in the time of Philip of Macedon. He obtained a prize for four plays, 'Œdipus,' 'Lycan,' the 'Bacchantes,' and 'Athamas.'

Xenocrates, zē-nōk'rā-tēz, Greek philosopher: b. Chalcedon 366 B.C.; d. 314 B.C. He was a pupil and friend of Plato, whose friendship he gained, and though of a dull and sluggish disposition, supplied the defects of nature by unwearied attention and industry. He succeeded Speusippus in the school of Plato about 339 B.C., presiding over the academy till his own death 25 years later. He was famed for his integrity and it is said that when he appeared in the court as a witness the judges dispensed with his oath. He was the author of numerous works, none of which, however, are extant.

Xenon, a gaseous chemical element discovered by Ramsay and Travers (1898) in the residue left after the evaporation of a large quantity of liquid air. Symbol X; atomic weight 128. It is an inert chemical element having a spectrum somewhat resembling argon.

Xenophanes, zē-nōf'ā-nēz, Greek philosopher and poet; founder of the Eleatic school of philosophy: b. Colophon, Asia Minor, about 570 B.C.; d. about 480 B.C. He was a contemporary of Pythagoras and Anaximander, and having been banished from his native city went to Sicily, and thence to Magna Græcia. He settled, about 536 B.C., at Elea (Velia), whence his system, and the school which he founded, derive their name. Of his poems, in which he treated of philosophical and other subjects, only fragments are preserved in the works of Athenæus, Plutarch, and others. The portions of his didactic poem, 'Peri physeos' (On Nature) have been collected by Brandis in his 'Commentationes Eleaticæ' (1813), and by Karsten in his 'Philosophorum Græcorum veterum reliquie' (Vol. I, 1830). He was an ardent monotheist and declared that Homer and Hesiod attributed

actions to the gods that were disgraceful for men. Consult: Ueberweg, 'History of Philosophy,' English trans. (1872); Zeller, 'Philosophie der Griechen,' 4th ed. (1900). See **ELIATICS**.

Xenophon, zén'ô-fôn, ancient Greek historian and general: b. Athens about 434 B.C.; d. Corinth about 355 B.C. He lived during a period in which the greatest political and intellectual excitement existed at Athens, and in which the most distinguished men, of whom he was one, appeared on the stage. Xenophon was a disciple of Socrates. He was said to have fought with his teacher in the Peloponnesian war, and to have had his life saved by Socrates in the battle of Delium (424 B.C.), but this is not now accepted. When the Persian prince, Cyrus the Younger, contended with his elder brother Artaxerxes Memnon for the throne, the Lacedæmonians sent him auxiliaries, among whom Xenophon served as a volunteer. Cyrus was defeated and lost his life on the field of Cunaxa (401 B.C.). The principal officers of the auxiliary army having been likewise killed in battle, or taken prisoners by artifice, and then put to death, Xenophon was apparently selected to command the Greek forces, 10,000 men strong. They were in a most critical situation, in the midst of a hostile country, without cavalry, surrounded by enemies and innumerable difficulties; but Xenophon was able to inspire them with confidence, to repress insubordination, and to lead them in their return march of 1,500 miles to the Black Sea. Xenophon himself has described this retreat, and at the same time the whole expedition of the younger Cyrus, in his 'Anabasis,' the most famous of military narratives. There is no means of verifying the statements of this work. On their arrival at Chrysopolis (opposite Byzantium) a number of the troops, with Xenophon at their head, entered the service of Seuthes, king of Thrace. Later, Xenophon joined the Spartan general Thimbron or Thibron, who was then conducting the war against the Persian satraps Pharnabazus and Tissaphernes. There is no reason to believe that Xenophon left Asia Minor before 394, when he returned to Greece with Agesilaus, king of Sparta, after his expedition against the Persians. In that year he fought on the side of the Spartans against the Athenians at Coroneia. As a consequence he was found guilty of high treason, and exiled. After that he settled at Scillus, a small town in the neighborhood of Olympia, in Elis. In this solitary retreat he dedicated his time to literary pursuits; and as he had acquired riches in his Asiatic expeditions, he began to adorn the country which surrounded Scillus. He built a magnificent temple to Artemis in imitation of that of Ephesus, and spent part of his time in rural employments, or in hunting in the woods and mountains. He does not appear ever to have returned to Athens, although the sentence of banishment passed on him was afterward repealed. He remained for about 20 years at Scillus, but was ultimately expelled from it (371 B.C.) by the Eleans. Thereupon he retired to Corinth, where he died. Besides the 'Anabasis,' Xenophon wrote the 'Apomnemoneumata,' more commonly known as the 'Memorabilia Socratica,' in which there is no doubt that we have a faithful representation of one side of the Socratic teaching; the 'Cyropædia,' in which, under the guise of a life

of Cyrus the Elder, there is an exhibition of Xenophon's views respecting the best form and methods of government; the 'Symposium' (Banquet), in which Socrates is brought before us under his social aspect; and of several minor works on hunting, agriculture, politics, and the science of war. The style of Xenophon is in general a model of simplicity. The Greeks esteemed his merit as a writer so high that they called him the 'Attic bee' and the 'Attic muse.' Later criticism has found that in both vocabulary and syntax he frequently deviates from the best Attic usage. His works have been often published separately and together. Among the best editions of the complete works of Xenophon are those by Schneider and others (1791-1849), Sauppe (1865), and Dindorf (1875). There is a complete English translation by H. G. Dakyns, with introductions and notes (1890-3). Consult also the studies by Croiset (1873) and Roquette (1884).

Xenophon of Ephesus ('XENOPHON THE YOUNGER'), Greek writer who flourished in the 2d century A.D. One work of his has been preserved, a story in five books, called 'Ephesiaca; or The Loves of Abrocomas and Anthia.'

Xenon, zén'ô, Stefanos Theodoros, Greek author. From 1855 he was a merchant and general broker in London, and in 1858 was naturalized as a British citizen. He published: 'The Devil in Turkey' (1850), a three-volume English translation from the author's unpublished Greek manuscript; in Greek, 'The Heroine of the Greek Revolution' (1861), translated as 'Andronike' (1867); 'East and West: A Diplomatic History of the Annexation of the Ionian Islands to the Kingdom of Greece' (1865); and 'Depredations: or Overland, Gurney and Co. and the Greek and Oriental Steam Navigation Company' (1869).

Xenotime, a mineral occurring in crystals of the same form as zircon. It is essentially an yttrium phosphate, YPO_4 , but much erbium is frequently present, and also sometimes the cerium metals, and small quantities of thorium and silicon. It is usually found in minute crystals of resinous or vitreous lustre, yellow or brown color, and having a hardness of 4 to 5 and specific gravity of about 4.5. It occurs as an accessory constituent in many granites (see Derby in Am. J. Sc. 41, 308, 1891), in large crystals in the granitic rocks of Norway, in the auriferous gravels of North Carolina and Georgia, and in choice crystals in the gneiss of New York city. When obtainable in sufficient quantities it will be an important ore of yttria and erbia.

Xeres, há'rás, Francisco, Spanish historian: b. Seville about 1500; date of death unknown. He accompanied Pizarro, as his secretary, to Peru, about 1530, and of that expedition wrote a detailed history, entitled 'A True Account of the Conquest of Peru' (1547). The work was translated into Italian by Ramusio, and into French by Ternaux-Compan and is still valued as a source of information.

Xeres, or **Jerez**, de la Frontera, Spain, a town in the province of Cadiz, on the Guadalete, 15 miles north-northeast of Cadiz, in a beautiful and fertile plain. Its manufactures are unimportant; but the trade, of which the staples are corn and wine, is very important. The wine is widely known as the popular sherry, and is

XEROPHYTES—XIMENES

largely exported. Near this town a battle was fought between the Moors and Goths in 711, in which Roderick, the last king of the Goths in Spain, lost his life.

Xerophytes, xér'ô-fīts, plants which have guarded themselves by structural means against excessive transpiration. The term was originally applied to plants living in dry and sandy soil, or on rocks, and to those inhabiting deserts; but it is now extended to plants existing in localities where, for one reason or another, they can not readily obtain water, as in the case of beach plants and epiphytes, and have consequently adapted themselves to prevent the waste of the moisture which they have. This result is obtained in various ways. In some, the transpiring surface is greatly reduced, and the foliage is nearly or wholly dispensed with, the stems themselves taking its place, as in switch plants and cacti; and this habit is frequently combined with the storage of water in succulent tissues. Other plants, like the eucalyptus trees predominating in the dry forests of Australia, by a vertical arrangement of their foliage, or a similar disposition of the branches themselves, when foliage is wanting, as it is in the casuarinas, avoid presenting broad surfaces to the sun and hot winds. Some erophytic plants close their leaves just before the dry season; the whole existence of others begins and ends during the continuance of a rainy season; and in the bulbous and tuberous plants we see still another common arrangement for passing the dreaded dry months, the plants growing vigorously and completing their above-ground existence, while the weather is still favorable, and storing up food in their roots or rootstocks, so that they may rest uninjured in the ground during the heated term, and be ready to spring into activity as soon as the rains begin. An extensive development of ligneous tissue is characteristic of xerophytes, and so also are such modifications of tissue as the matted hairs, mineral, waxy and varnish-like encrustations on the epidermis, the closing or concealing of stomata, etc.

Xerxes I., xér'k'séz, king of Persia: b. about 519 a.c.; d. 465 a.c. He was the second son of Darius, the son of Hystaspes, and began to reign in 485. He was preferred to his brother Artabazanes, born before his father was raised to the throne; while Xerxes was born after that event, and was the son of Atossa, daughter of Cyrus, but this preference caused no struggle between the brothers. After having suppressed a revolt in Egypt in a single campaign, he thought himself able to execute the plan of conquering Greece, already conceived by his father, and collected for this purpose an immense army, estimated by the historians as containing 1,000,000 men. In all probability the Greeks greatly exaggerated the number of their enemies; and the train of women and slaves who followed the army made at least half of its numerical amount; still the numbers of the Persians were beyond all comparison superior to those of the Greeks. By means of a bridge of boats Xerxes crossed the Hellespont (480) while the Greeks awaited him on the frontier of their country, in the pass of Thermopylae. After the heroic Leonidas had fallen with his Spartans (see **LEONIDAS**), Xerxes burned Athens, which had been forsaken by

its inhabitants. The first naval battle between the two powers at Artemisium had been indecisive; but it inspired the Greeks with new confidence; and the second naval action at Salamis, in which, if we believe the Greek historians, 2,000 Persian vessels were engaged against 380 Greek, terminated in the defeat of the Persians (Sept. 480). Xerxes now quitted Greece, leaving behind him his best general, Mardonius, who, not long after, was routed at Plataea. Xerxes now gave himself up to debauchery; his conduct offended his subjects and Artabanus, the captain of his guards, conspired against him, and murdered him in his bed. The personal accomplishments of Xerxes have been commended by ancient authors; and Herodotus observes that there was not one man among the millions of his army that was equal to the monarch in comeliness or stature, or as worthy to preside over a great and extensive empire.

Ximena, hê-má'ná, in Spanish legendary history, the wife of the Cid (q.v.).

Ximena, or the Heroic Daughter, an English adaptation of Corneille's 'Cid,' by Colley Cibber, first played in London in 1712, and printed in 1718.

Ximenes, xi-mé'néz, Sp. hê-má'nás, Francisco, Spanish ecclesiastic and prime minister: b. Torrelaguna, Castile, 1436, d. Roa, near Valladolid, 8 Nov. 1517. He was graduated in civil and canon law at Salamanca in 1456, became a priest and going to Rome practised in the courts of the consistory 1459-65. He obtained a papal bull, which secured to him the first vacant benefice in Spain, but the archbishop of Toledo refused to give him any place, and, Ximenes having taken possession of a vacant benefice the archbishop caused him to be imprisoned. Ximenes, nevertheless, recovered his freedom, and the Cardinal Gonzalez Mendoza, bishop of Sigüenza, appointed him his grandvicar. He entered the Franciscan order in 1483, and for several years practised the most rigid asceticism. In 1492 he became confessor to Queen Isabella of Castile, to whose notice he had been recommended by Cardinal Mendoza, and in 1495 was made archbishop of Toledo. He did not accept this dignity till after many refusals, and an express command from the pope. As an archbishop he was very zealous, behaving as a father toward the poor, abolishing a multitude of abuses, and adhering steadfastly to his resolution that public offices should be filled with honorable and well-qualified men. In spite of all opposition he effected a reform in the mendicant orders of Spain, founded in 1499 a university at Alcalá de Henares, and undertook in 1502 the Complutensian Polyglot Bible. His activity was also displayed in other ways. Dissensions prevailed in the royal family. Philip of Austria, son of the Emperor Maximilian I., had married Joanna, the only daughter of Ferdinand and Isabella, and on the death of the latter Philip received Castile, in right of his wife, the sole heiress of her mother. This gave rise to disputes between him and his father-in-law, which were composed by Ximenes. After Philip's death (1506) Ferdinand became regent of Castile for his grandson, afterward the Emperor Charles V., who was a minor. On this occasion he had been much assisted by Ximenes, who in 1507 was made cardinal and grand-inquisitor of Spain. The conversion of the Moors

now particularly occupied his attention. With this view he formed the project of passing over to Africa, in order to take the fortress of Oran, and in May 1508, landed on the coast of Africa. A battle soon followed in the neighborhood of Oran, in which the Moors were defeated. The fortress was immediately taken and the garrison put to the sword. Ximenes caused Oran to be fortified anew, changed the mosques into churches, and returned as a conqueror to Spain. When Ferdinand died in 1516, his grandson Charles being still a minor, Ximenes became regent of Spain, during his regency of two years, brought the finances into order, paid the crown debts, and restored the domains which had been alienated, caused the laws to be observed, and placed the Spanish military force upon a respectable footing. Consult: Fléchier, 'Histoire du Cardinal Ximenes' (1693); Hefele, 'Der Kardinal Ximenes' (1844, English trans. 1860); Barrett, 'Life of Cardinal Ximenes' (1813); Prescott, 'Ferdinand and Isabella' (1838); 'Life,' by Ulrich (1883).

Ximenes de Quesada, dá ká sá fhí, **Gonsalo**, Spanish explorer and conqueror: b. Granada about 1498; d. Mariquita, New Granada, 16 Feb. 1579. He came to America in 1535 as a judicial functionary in the suite of Pedro Fernandez de Lugo, governor of the province of Santa Marta, who chose him to head an expedition against the Chibchas, supposed to number more than 2,000,000 souls, on the great plains of Tunja and Bogota, and the neighboring regions about the head-waters of the river Magdalena. He set out 6 April 1536 from Santa Marta, but at the end of eight months had made no more than 450 miles. After great hardships the expedition reached the mountains and in the following March progress was resumed.

The first Indians he met were so terrified by the sight of his horses that they instantly submitted. Approaching at Tunja the court of one of the great chiefs of the Chibchas, he was allowed to enter the palace, but was treacherously attacked as he was about to embrace the chief. The chief was taken, after much slaughter, and Ximenes became possessed of vast riches. From Tunja he marched upon Iraca, the sacred city of the nation. Here two Spanish soldiers, in pursuit of plunder, accidentally set fire to the great temple of the sun, which had been captured by Ximenes, and it perished with the city after burning several days. Returning toward Tunja, he fought a desperate battle at Borja against 12,000 natives, whom he defeated, after which he made treaties with several caciques, who voluntarily submitted. A usurping chief was then proclaimed king of Spain, but was required to deliver the treasures of his predecessor to the Spaniards. After a short imprisonment he promised within forty days to fill a room with gold and emeralds, but not keeping his promise, was put to death with cruel tortures. On 6 Aug. 1538 Ximenes founded the city of Santa Fé de Bogota.

He was presently joined by Benalcázar, the lieutenant of Pizarro, and Frederman, who presently conspired against Ximenes, but without much success. The three then returned to Europe to lay their claims before Charles V., but while Benalcázar was made governor of Popayan, Frederman and Ximenes gained nothing. Later, however, Ximenes was made marshal of New

Granada, and returning to Bogota in 1551, seems to have protected the people against the rapacity of Spanish officials. About 1561 he was named by the Spanish government *adelantado*, or governor-in-chief of the kingdom of New Granada, and induced to fit out an expedition in search of El Dorado, beyond the territories of Pauto and Papamene. To this enterprise he devoted three years, spending immense sums in fitting it out, but returning with only a handful of followers. In 1572 he founded the city of Santa Agueda, 21 miles from Mariquita. He died of leprosy, and by his will declared himself poor and forbade the erection of any but the simplest monument over his grave. His remains were removed to Bogota in 1597. He left a manuscript work entitled 'Sermones' and a 'Compendio historial,' both of which are lost. Consult J. Acosta, 'Historia del descubrimiento y colonización de la Nueva Granada' (1849); Antonio de Plaza, 'Memorias para la historia de la Nueva Granada' (Bogota 1890).

Xime'nia, a genus of *Oleaceae*, represented by large shrubs or small trees, often spinous. Leaves entire, leathery; calyx very small, petals four, hairy inside; stamens eight, ovary with four one-seeded cells. *X. americana*, the false sandalwood, is a straggling Indian shrub, or low spreading tree; producing dull-white fragrant flowers, smelling like cloves, succeeded by small, oval, red or yellow pulpy fruits, an inch long, aromatic, but somewhat astringent. They contain a white globose nut with a kernel which tastes like a filbert. Its wood is very tough and heavy. This shrub is known in Florida as the hog-plum or wild lime, and in the West Indies as mountain or seaside plum.

Xingú, shén-goo', a river of Brazil, one of the chief tributaries of the Amazon. It is formed by the junction of several head-streams which rise near lat. 15° S., lon. 55° W. Chief of these is the Tamitatosba, which flows from a small lake about 75 miles in circumference. After flowing north for 1,200 miles through a densely forested and little explored region, the Xingu forms a large lake which is connected with the Amazon estuary by a number of deltaic channels 240 miles west of Pará. Steamers ascend the river to the Cataract and Fall of Itamaracá. The river was unexplored until 1884-7, when it was descended from Cuyabá by Von den Steinen.

Xiphodontidae, xíf-ô-dôn'tí-dé, a family of primitive forerunners of the ruminants, whose remains occur in the Upper Eocene rocks of western Europe. Some of them are the largest and most slender artiodactyls of their age, and the only feet hitherto discovered are two-toed, with mere rudiments of the lateral digits. Compare *Oreodon*.

Xiphosura. See HORSE-FOOT CRAB; *Mesostomata*.

Xuarez, hoo-á'ris, Gaspar, Paraguayan botanist, historian, and biographer: b. Santiago del Estero, Paraguay, 17—; d. Rome, Italy, 1804. Entering the order of Jesuits, he devoted himself to teaching philosophy and theology; and after the suppression of his order he removed to Italy, where he occupied himself with botanical researches. He wrote: 'History of Buenos Ayres,' and 'Dissertations,' which remain in MS.; 'Life of St. Francis Xavier'; etc.

XULLA—XYLOPIA

Xulla, shoollā, or **Zorella**, Islands, East Indies, a group in the Molucca Sea, south of the Molucca Passage, and east of Celebes. The largest islands of the group are Taliabo, Mangola, and Xulla Besi. The first is about 40 miles long.

Xurel. See HORSE-MACKEREL; JUREL.

Xylander, ksi-län'dér, **Guilielmus**, German scholar: b. Augsburg 20 Aug. 1532; d. Heidelberg 10 Feb. 1576. His real name was Holzmänn. He was educated at Tübingen and Basel and in 1558 was appointed professor of Greek at Heidelberg. His numerous Latin translations from the Greek have been of much service to later students.

Xylene, in chemistry. Three isomeric hydrocarbons are known by this general name, orthoxylene, metaxylene, and paraxylene. They all have the composition $C_6H_4(CH_3)_2$, and are dimethyl derivatives of benzene. Commercial xylene or zylol, found in coal tar, is a mixture of the above three. It is a colorless, oily liquid, boiling above $140^\circ C.$, not soluble in water, and used as a solvent in various chemical operations.

Xylography. See WOOD ENGRAVING.

Xylodin, in chemistry, an explosive probably of the composition $C_6H_5NO_4O_8$, known also as pyroxylam and nitrostarch. Discovered by Braconnet in 1833 and prepared by dissolving one part of potato starch in eight parts of fuming nitric acid and then pouring this solution, well cooled, into sixteen parts of concentrated sulphuric acid. It is a white hygroscopic powder, insoluble in water and alcohol, but

soluble in ether. It is not used to any considerable extent.

Xylophone, a musical instrument consisting of bars of wood or glass graduated in length and resting on belts. The notes are produced by striking on the bars with small hammers.

Xylo'pia, a genus of anonaceous trees or shrubs, natives of tropical regions, with coriaceous leaves, commonly two-ranked, and flowers in axillary clusters or solitary. The corollas have six petals, the outer three elongated, boat-shaped, curving over and partially enclosing the other three. The receptacle is conical, with the stamens outside and the carpels in its excavated interior. The fruits are elongated berries. *X. sericea*, the pindaíba of Rio Janeiro, bears a highly aromatic fruit, which may be used as pepper, with which it agrees in its flavor. Good cordage is made from the fibres of its bark. The wood, bark, and berries of *X. glabra*, the bitter wood of the West Indies, taste like orange seeds, and impart a similar flavor to the wild pigeons which feed on them. It is said to be useful in colic and for creating an appetite. Martius believes the fruit of *X. grandiflora* to constitute a valuable febrifuge used by the South American Indians. The dry, black, and quill-like fruits of *X. aromatica* form the *Piper athiopicum* of commerce, used as pepper by the West African negroes, as they are aromatic. They are sold in the native markets as a stimulant and condiment. *X. polycarpa* is the yellow dye-tree of tropical Africa, with a bitter bark, that contains berberine, and which yields a yellow dye, of extensive use; it is also employed for the treatment of bad ulcers.

Y

Y the twenty-fifth letter of the English alphabet, derived from the Greek through the Latin, is both vowel and consonant. It came into Latin in Cicero's time in spelling words borrowed from the Greek; for the Latin language has no sound like that of the Greek *Y* (upsilon); the *y* found in some Latin words, as *lacryma*, *satyrus*, *syllus*, is due to an error of modern editors; those words were in ancient Latin always written *lacrima*, *satira*, *silla*. The modern Italian alphabet has no *y*, and the *y* of Greek words adapted into Italian is changed to *i*: *sinfonia*, *symphony*, *sindico*, *syndic*. In Dutch, *y* stands for *ij*, and represents the diphthongal long *i* of English as in *time*. In English, *y* is a superfluous letter, so far as it stands for a vowel sound, as such, it can always be represented by the vowel *i*. The sound of *T*, *θ*, in Greek, was that of French *u* and German *ü*. This sound does not exist in English: it is heard when, with lips and tongue in the positions for pronouncing the vowel sound *oo*, one tries to give the English vowel sound of *e* in *he*. In early English or Anglo-Saxon, *y* represented this peculiar vowel sound; but it has so far dropped out of English speech that a person whose only speech is English cannot pronounce it untaught. At the time of the Norman Conquest *i* had taken the place of this *y*, and soon both the sound and the letter went out of English use. But when Norman words came to be used by the English the French *u* sound was retained in many words, as *muse*, *lute*, *duke*, and they were pronounced with the French *u*; this sound gradually developed into *iu*, but the spelling remained unchanged: this *iu* represents the sound of *u* in *muse*, *duke* as now pronounced. In the beginning of syllables and when followed by a vowel, *y* is a palatal consonant, formed by bringing the middle of the tongue in contact with the palate, nearly in the position for *g* hard; hence Old-English *g* hard has often been softened into *y*, as in *day* from Old-English *dag*. Till comparatively recent times it was customary to write *tho*, *ye* and *that*, *yt*, and those forms were repeated in typography. In those cases the character resembling *y* or identical with it, stood, not for *T* but for the Old-English letter *ȝ*: it is a mere ignorantism to read "y^e year," *ye* year as though *y* here stood for the consonant *T*, and not for the digraph *th*.

Yachts and Yachting. The term yacht is not easily defined, for it is now applied to vessels of widely different size and build, propelled either by means of sails or by steam, electricity, or other similar power, and used for many different purposes, such as racing, cruising, exploration, state ceremonial, etc. Sailing yachts

may be of any rig suited to their size, chiefly cutters, schooners, ketches, yawls, and luggers.

History.—The word *yacht* is of Dutch origin, being from the Dutch *jagt*, a swift vessel, from *jagen*, to chase, to hunt. It seems to have been introduced into England in 1660 when the Dutch presented Charles II. with a yacht. The first recorded yacht race was that between Charles II. and his brother, the Duke of York, which took place on the Thames in 1661, but from that date none is on record till 1796, when ten boats started on a 50-mile race in the Bristol Channel under the auspices of the Bristol Sailing Society. Yacht-racing is a characteristic development of the 19th century, especially of its latter half. For a long period, extending well into the 19th century, yachting was closely connected with naval defense, and private yachts were generally constructed to carry guns and be used in case of need for naval purposes. Private individuals of means were thus able to contribute to national defense not only directly by forming a kind of minor volunteer fleet, but also indirectly by leading the way in the development of naval architecture. In 1832 the *Emerald*, the fastest cutter in the Royal navy, was defeated in a racing and sailing contest with the *Paddy* from Cork, a yacht belonging to a member of the famous Water Club of Cork, and in consequence the head of the government school of naval architecture in Portsmouth was deputed to measure several private yachts with a view to improving the construction of vessels for the navy. In the following year the *Water Witch*, a vessel similar to the 10-gun brigs of the navy, built for Lord Belfast, proved herself faster than any vessel in the Royal navy, and better than any of her kind for purposes of warfare. Of the many yacht clubs now in existence only the Royal Cork Yacht Club and the Royal Thames Yacht Club can trace their history back to a period before the last century. The premier yacht club of Great Britain, the Royal Yacht Squadron, with headquarters at Cowes, dates back to 1815 in its formal capacity. In 1820 it became the Royal Yacht Club, and in 1833 its name was changed by royal order to Royal Yacht Squadron. The Royal Northern Yacht Club, with headquarters at Rothesay, was founded in 1824. The remaining clubs in Great Britain number altogether about 120, of which about one third are Royal.

American Clubs.—In the United States there are more than 200 yacht clubs scattered throughout the country, having about 4,000 yachts. But of these vessels only about 700 are above 40 feet in length, and only a little over half of these are propelled by steam. The New York Yacht Club, the oldest in the United States, having been organized in 1844, has a membership of over 1,000, but there are only about 140

YACHTS AND YACHTING

steam yachts and launches on its list. Thus the sailing yacht is the normal type of American pleasure craft. There are two distinct kinds of yacht, whether propelled by sail or steam—the racing yacht, in which comfort is sacrificed for speed, and the commodious, well-proportioned cruiser yacht; but even in the latter every modern discovery tending to increased speed is incorporated. Popular interest in yachts may be dated from the victory of the yacht *America* in the international contest around the Isle of Wight in 1851. She represented certain American ideas in the shape of her hull and the fit of her sail, which were immediately copied in England. From that day the history of sailing yachts has been a steady improvement in speed through the efforts of such yachtsmen as James Gordon Bennett, General Charles T. Paine, C. O. Iselin, J. Pierpont Morgan, and William K. Vanderbilt, and such designers as the late Edward Burgess, A. Cary Smith, J. Beaver Webb, and Nat G. Herreshoff. The last named was the author of both the latest international cup-racers, *Vigilant* and *Defender*. The same designers have won golden opinions for their work in the field of steam-yachting, as have also Gustav Hillmann, Lewis Nixon, C. D. Mosher, and Charles M. Seabury; and American yards can now turn out steel steam-yachts equal to the best made in England.

Racing Yachts.—The designing and construction of a racing yacht require no small amount of scientific and technical knowledge besides large experience, and consequently the yachts entered for the leading races, at least in the higher classes, are the work of a very few designers and builders. In a yacht intended for racing, speed is the primary essential, and to it accommodation and convenience are in large measure sacrificed. Moreover, a designer has to take into account the circumstances under which his vessel is to be run, or the competitors which she has to meet, because a yacht that does well in fine weather and a smooth sea will usually be of little account in boisterous weather and a rough sea. The rating rules of the Yacht Racing Association (formed in 1873) also condition the designer's work, and it will be necessary, therefore, to give some account of them here. The object of rating regulations is to secure that all competitors shall start on practically even terms in any given race, and this is achieved by the classification of yachts in well-defined groups according to certain measurements, and also, especially among large yachts, by means of time allowances corresponding to differences in these measurements. In the early days of racing, yachts were grouped according to tonnage, the tonnage being determined, as for other vessels at that time, by multiplying the length by the breadth and the depth and dividing by 96 (afterward 94). This was replaced by what is called builder's measurement or old measurement, which is still in use for some purposes connected with yachts. The formula for tonnage

$$(L - \frac{1}{4}B) \times B \times \frac{1}{4}B$$

according to this system is

where L and B denote length and breadth respectively. The Thames measurement rule, introduced in 1854, made tonnage equal to $(L - B) \times B \times \frac{1}{4}B$; but in 1881 the Yacht

Racing Association introduced the 1730 rule, according to which the tonnage was equal to $(L \times B)^2 \times B$.

These rules were found to

1730

have the effect of encouraging the construction of yachts of very narrow beam, especially after about 1871, when designers learned the use of outside ballast on the keel. A great change was effected in 1886, when the length-and-sail-area rule came into force, and yachts were classified according to rating determined by the formula

$$\text{Length} \times \text{Sail Area in sq. ft.}$$

The present

6000

linear rating rule was adopted in 1896, but it cannot be said that finality has yet been reached. Linear rating is expressed in feet, and is determined by the formula

$$\text{Length} \times .73 \text{ Girth} \times .5\sqrt{\text{Sail Area}}$$

2

The relation of the classes under the 1881, 1886, and 1896 rules may be shown as follows: 18 feet linear rating = $\frac{1}{4}$ rating (length and sail area); 24 feet = 1 rating; 30 feet = $2\frac{1}{4}$ rating; 36 feet = 5 rating = 3 tons; 42 feet = 10 rating = 5 tons; 52 feet = 20 rating = 10 tons; 65 feet = 40 rating = 20 tons.

For the smaller vessels wood is the cheapest and lightest material, but larger ones are made of steel, or of steel frames with a wooden skin, the latter class being called composite. Other metals, notably aluminum, have also been used for the construction of yachts. Practically all large composite vessels, and also many small ones, have a copper sheathing to protect the submerged parts of the wood from the action of the water. The sails of racing yachts are generally made of cotton, mostly of the finest Egyptian variety; but ramie fibre is coming into use for this purpose, and a mixed cotton and ramie material is also in use. Up till a comparatively recent date flax was generally used for the sails of racing yachts, though it does not produce a sufficiently smooth and close-textured cloth.

Speed.—The speed of a racing yacht of given size may be regarded as the result of a compromise between stability, which determines sail-carrying power, and resistance. The stability depends upon well-known hydrodynamic principles, and may be roughly said to be determined by breadth of beam, the lowness of the centre of gravity of the vessel, and the quantity and position of the ballast. Resistance at low speeds is due chiefly to surface or skin friction, but at higher speeds it is principally caused by wave-making, a phenomenon too intricate to be discussed here. An increase in beam increases stability, but at the same time increases skin friction. Wave resistance is less in vessels whose displacement is obtained mainly by breadth than in those where displacement is principally determined by depth. Various means of lowering the centre of gravity have been adopted with advantage, such as the use of hollow masts and booms, the use of aluminum for the upper part of the vessel's sides, etc. Stone ballast was used in the early days of yachting, but it was superseded by iron, and that in turn by lead. The lead ballast was afterward carried on a plate of

YACHTS AND YACHTING

lead projecting far below the hull. At present the deep fin-keel is of some other metal than lead, and carries the lead at its base in a cigar-shaped bulb. Surface friction is lessened by making the submerged surface smooth, either by coating it with varnish, or by covering it with polished metal, or in some similar way. The chief names in the evolution of the present shape or lines of yachts from the old "cod's head and mackerel's tail" varieties are those of Scott Russell and John Hyslop, the latter an American. The curve of cross sections for the fore part should be nearly a curve of versed sines, and that for the hinder part a trochoid; but various considerations may modify these theoretical forms. If two vessels differ in nothing but length, the longer will be the faster. The centre-board keel, consisting of a plate of iron which can be raised or lowered according to circumstances, was of British invention, but is now most characteristic of American racing yachts.

Racing Rules.—The ordinary rules of the road at sea apply in the main to yacht-racing. Yachts sailing with the wind free must clear those sailing close-hauled. Yachts on the port tack must give way to those on the starboard tack, and an overtaking yacht must clear the overtaken vessel. The start in a yacht race is now always a flying one, but prior to about 1860 yachts started from anchor. Frequently much depends upon the start, and accordingly maneuvering for initial position is of considerable importance. At the start, as throughout the race, the skipper counts for a good deal. The course to be traversed is marked out by buoys, light-ships, or flag-boats. The time allowances corresponding to differences in rating are determined in accordance with a scale prepared by the Yacht Racing Association. Vessels always start together, the time allowance being made at the end of the race. Handicapping is also practised to some extent in yacht-racing.

British Yachts and Races.—Among pioneer British yachts of the first half of the 19th century the most notable were the *Menai*, in which the hollow bow was first introduced; the *Mosquito* (1848), an iron vessel built on the Thames in accordance with Scott Russell's theories; and the *Tiara*, built at Renfrew in 1850. The visit of the *America* from the United States in 1851 marked an epoch in British yachting. She was a schooner of 208 tons, and entered along with 14 other vessels for a race round the Isle of Wight. Five of the vessels were schooners, nine were cutters, the remaining one being a bark (*Brilliant*), and though they varied in tonnage from 47 (*Aurora*) to 393 (*Brilliant*) no time allowance was given. The *America* won the race and the cup presented by the Royal Yacht Squadron, the *Aurora* coming second, 18 minutes behind. In 1857 the cup was set aside by the owners of the *America* as a perpetual international challenge trophy. This was the origin of the contests for the so-called *America Cup*, for which see the next section. The victory of the new-comer secured the triumph of the views represented in the *Mosquito* and the *Tiara*, and revolutionized the practice of British yachtsmen. For about a quarter of a century the schooner was the popular form of racing yacht, among the most notable being *Cambria* and *Miranda*. Gradually, however, the schooners were displaced by cutters and yawls.

The more famous of the early racing cutters were *Kriemhilda*, *Oimara*, *Cythera*, *Vol-au-Vent* (1875), and *Neva* (1876); and the leading yawls of that period were *Florinda* (1873) and *Julianar* (1877). *Formosa*, a big cutter built in 1878, was supreme in her class till 1880, when G. L. Watson's first large yacht, the *Vanduaara*, came on the scene. Another famous designer, Mr. Fife, scored a great success with the 40-ton yacht *Annasona*, which began to compete in 1881. *Marjorie*, from Watson's lines, a vessel of 68 tons, was the chief new cutter of 1883; and to the following year belong *Irex*, designed by Mr. Richardson, and *Genesta*, an America Cup competitor designed by Beaver Webb. The *Galatea*, another cup challenger, was a complete failure in home waters in 1885, but the challenger of 1887, *Thistle*, from Watson's design, met with great success before crossing the Atlantic. *Thistle* was the first large yacht constructed under the length-and-sail-area rule. *Yarana*, another Watson boat, was the chief novelty of 1888, and in 1889 the same designer produced *Valkyrie I* for Lord Dunraven. The old *Irex* continued racing with considerable success down to 1889, and was succeeded in 1890 by *Iverna*, by the same designer. In the latter year *Thistle* reappeared, and thus the leading yachts of that season were *Yarana*, *Valkyrie I*, *Thistle*, and *Iverna*. These were rated at 69, 77, 121, and 118 respectively. The *Valkyrie I* was ultimately sold to an Austrian archduke, and the *Thistle* to the German emperor, who renamed it *Meteor*. The years 1891 and 1892 were chiefly remarkable for smaller vessels, such as Watson's *Queen Mab* and *Varuna* and Fife's *Thalia* and *Lais*; but 1893 was rendered memorable in the annals of yachting by fine contests between *Valkyrie II*, designed by Mr. Watson for Lord Dunraven; *Britannia*, designed by Watson for the Prince of Wales; *Satanita*, *Calluna*, and *Navahoe*, an American yacht, designed by Mr. Herreshoff. *Valkyrie II* proved to be the best of these cutters, but *Britannia* was a good second. In 1894 these yachts competed with *Vigilant*, a Herreshoff vessel which had defeated *Valkyrie II* in the contest for the America Cup. *Valkyrie II* was sunk by *Satanita* in the Clyde while maneuvering for a start, but *Britannia* repeatedly beat the *Vigilant*. The *Ailsa*, from lines by Mr. Fife, Jr., and the *Valkyrie III*, designed by Mr. Watson for Lord Dunraven, appeared in 1895. The third *Valkyrie* went to America to contest the cup, and the honors at home fell to *Britannia* and *Ailsa*, especially the former. Mr. Fife, however, scored in the 40-raters with *Isolde*, which was distinctly better than Mr. Watson's *Caress*. A new *Meteor*, designed by Mr. Watson for the German emperor, competed in 1896 against *Britannia* and *Ailsa*, the result for the season being: *Ailsa* (60 starts, 21 firsts), *Britannia* (58 starts, 14 firsts), *Meteor* (22 starts, 13 firsts). The principal first-class cutters since that date are: *Bona*, by Watson (1897), for the Duke d'Abruzzi; *Shamrock I*, built for Sir Thomas Lipton to contest the America Cup in 1899; and *Shamrock II*, built for Sir Thomas Lipton to contest the America Cup in 1901.

American and International Yachting.—The *Jefferson*, built in 1801, is regarded as the first yacht built in America; but the first American yachts of importance were those designed by George Steers, notably the *America*. In 1866

YADKIN RIVER—YAKIMA

three American yachts, *Henrietta*, *Fleetwing*, and *Vesta*, raced across the Atlantic, the first-named winning the race with a time of 13 days, 21 hours, 55 minutes. In 1870 the English yacht *Cambria*, which had challenged for the America Cup, beat the American *Dauntless* in a transatlantic race, but she was beaten by the *Magic* and several other boats in the race for the cup. In 1873 Mr. Ashbury, who owned the *Cambria*, again challenged for the cup, but his yacht *Livonia* was defeated by the New York Club's vessels *Columbia* and *Sappho*. Major Charles Gifford, a Canadian, challenged for the America Cup in 1876 with the *Countess of Dufferin*, but his yacht was beaten by the defender, *Madeline*. Another Canadian vessel, the *Atlanta*, contested the cup in 1881, her opponent being the *Mischief*, but the result was the same as before. Sir Richard Sutton sent the next challenge in 1884, and his yacht *Genesta* was pitted against the *Puritan*, but without success. The *Puritan* was designed by Edward Burgess, as was also the *Mayflower*, which successfully defended the cup against the English *Galatea* in 1886. The *Thistle* met another Burgess boat, the *Volunteer*, in the same contest the following year, but, like all preceding challengers, she failed to gain the cup. Mr. Herreshoff scored his first great success as a designer with *Gloriana* in 1891, and soon afterward he produced the *Vigilant*, which defeated *Valkyrie II* in the America Cup contest of 1893. The cup contest of 1895 between Lord Dunraven's *Valkyrie III* and the American Defender had an unsatisfactory result. Two races were awarded to the latter on purely technical grounds, and in consequence Lord Dunraven withdrew from the competition. In the same year a Canadian yacht named *Canada* defeated the United States yacht *Vandedor* in a competition for an international cup. The next challenges for the America Cup came from Sir Thomas Lipton, whose yachts *Shamrock I* and *Shamrock II* were beaten by the American *Columbia* in 1899 and 1901 respectively. Sir Thomas again challenged for the cup in 1902 and 1903, and lost to the Americans.

Steam Yachts.—The use of steam has been a great factor in the increase of interest in private yachts. The cost of steam yachts varies widely even without taking into account the expenditures for furnishings. A yacht 160 feet in length may be built for \$60,000, while one of the 300-foot boats, the largest type, will cost from \$400,000 to \$500,000. One of the most superbly fitted private yachts, though not of the largest class, is the *Niagara*, owned by Howard Gould. It cost \$500,000, and requires \$10,000 a month to keep it in commission. The *Margarita II*, built for Anthony J. Drexel, the Philadelphia banker, was very large and finely equipped. William K. Vanderbilt owns the *Valiant*, 332 feet long, and probably the largest American private yacht afloat. The *Mayflower* and *Nahma*, owned by the Goetts, were built on the Clyde. The most magnificent private yachts owned in Europe are the Hohenzollern, belonging to the Emperor of Germany, which visited New York in February-March 1902, and the *Atmah*, built for Baron Edmond de Rothschild.

Yadkin River, North Carolina. See GREAT PERRA.

Yadrintsef, Nikolai Michailovitch, Russian author: b. Siberia 1842; d. Barnaul, Altai

Mountains, 19 June 1894. Accused in youth of conspiring for the independence of Siberia, he was exiled to Archangel, but later was permitted to return and was appointed on the staff of Gov.-Gen. Kaznakof. Between 1865 and 1875 he traveled extensively in Siberia, publishing the results of his explorations and in 1882 founded the 'Eastern Review,' a strong, popular weekly devoted to the interests of Asiatic Russia. In 1891-2 he made careful explorations in Mongolia, discovering the ruins of the ancient capital of the Tartar Khans, and forming archaeological collections of great value. In 1893 he visited the United States. He was the founder of the Siberian University, and a promoter of universal education. Among his works are: 'The Russian Commune in Prison and in Exile'; 'Siberia as a Colony'; 'The Culture and Industrial State of Siberia', etc.

Yaguarondi, yā-gwā-rūn'dē. See JAGUA-RONDI.

Yahoo, yā-hoo', a name given by Swift in his 'Gulliver's Travels' to a race of brutes, described as having human forms and degraded propensities. They were subject to the Houyhnhnms, or horses endowed with human reason. Hence, the term is applied to a rough, low, boorish, or uneducated person.

Yajur Veda, yā'joor vā'da. See VEDA.

Yak, the native name for the wild ox (*Bos grunniens*) of the mountainous regions of Tibet. There are two races: the wild yak, generally black, which is found near the snow line, descending into the valleys in winter, and a domesticated race of various colors, black and white being most common. The yak is about the size of the common ox, to which it has a general resemblance, but it is covered with a thick coat of long, silky hair, hanging down like the fleece of a sheep, completely investing the tail, and forming a lengthy fringe along the shoulders, flanks, and thighs. This fringe, which exists in both races, was apparently developed as a protection to the animal in its alpine haunts, as the long hair forms a sort of mat which defends the body from the effects of the cold when the animal is reposing in the snow.

The domesticated race is of great importance to the natives of Tibet. The yak is employed as a beast of burden, but never for tillage or draught; the milk is very rich, and yields excellent butter; the flesh is of the finest quality, and that of the calves far superior to ordinary veal. The hair is spun into ropes, and made into coverings for tents, and the soft fur of the hump and withers is woven into a fine strong cloth. The tails, often dyed red, are made into the chowries or fly-flappers, used in India. Yaks are often seen in zoological gardens and menageries, and have repeatedly bred in Europe; and it is probable that they might be advantageously introduced into the northern parts of the continents of America and Europe.

Yakima, yāk'ī-mā. See SHAHAPTIAN INDIANS.

Yakima, a river of the State of Washington, rising in the Cascade Mountains, and after a southeastward course of about 175 miles, flowing into the Columbia about six miles north of Pasco and Kennewick, and 10 miles above the confluence of the Snake River. It flows through an important coal-mining region, and its valley and those of its numerous short tributaries are

among the most fertile in the State. The Northern Pacific Railway traverses the whole length of the valley of the Yakima, almost to its source.

Yakima, or Stampede, Pass, a defile over the Cascade Mountains, in the State of Washington, near the source of the Yakima River (q.v.). Its highest point is 3,600 feet. It is crossed by the Northern Pacific Railway, which at an elevation of 2,800 feet, between Martin and Stampede, passes through the Stampede Tunnel, 9,850 feet long.

Yakoba, yā-kō'bā, or Yakubu, West Africa, a town in northern Nigeria, finely situated on a plateau partly surrounded by mountains, 140 miles southeast of Kano. It is walled, and the interior is finely diversified with gardens and ponds. The climate is healthful. Pop. 30,000.

Yakonan (from *yakwina*, "spirit"). A linguistic stock of North American Indians, consisting of the Alsea, Yakwina, Kuich, and Siu-slaw divisions. The home of the Yakwina was along Yaquina River, Oregon, from the site of Elk City to the sea; they were formerly numerous, occupying 56 villages in early days, but the tribal distinction of the Yakwina, as well as of the other Yakonan divisions, was gradually broken down through extensive intermarriage; there are only a few Yakwina left and these reside on Siletz reservation, but their number is unknown. The Alsea formerly dwelt in villages along both sides of Alsea River, Oregon, and on the adjacent coast; they are now on Siletz reservation, and perhaps a few are on Grande Ronde reservation. The Siu-slaw were also village dwellers, inhabiting Siu-slaw River as late as 1857; they are probably extinct. The Kuich, or Lower Umpqua, villages were on both sides of Umpqua River from its mouth upward for 30 miles; a few survivors still reside on Siletz reservation. The entire population of the Yakonan Indians probably does not exceed 400.

Yakub Beg, yā-koob' bēg, surnamed **ATTALIK GHAZI** ("leader of the champions of the faith"), amir of Kashgar: b. Russian Turkestan early in the 19th century; d. 31 May 1877. He distinguished himself in the defense of Khokan against the Russians. But he first rose to great eminence after the recovery of Kashgar from the Chinese in 1864, when he acted as lieutenant to Buzurg Khan, whom he soon supplanted. For 12 years this remarkable man conferred on a large part of Central Asia the benefits of a settled though rigorous government. He drilled and disciplined a large civil staff, while his army contained the best native soldiers in Central Asia. In his foreign policy he was strongly anti-Russian, and ultimately friendly to Great Britain. China, however, set out to recover its lost Mohammedan provinces, and had gained some victories when Yakub died—by assassination, some said. His realm at once fell in pieces. The Chinese armies overran the country (1878), and Kashgar again came under Chinese rule.

Yakub Khan, khān, amir of Afghanistan: b. 1849. Appointed governor of Herat, he became extremely popular, but in 1870 broke into open revolt, and in 1874 was imprisoned at Kabul. On the death of Shere Ali he was proclaimed amir (1879) and concluded a treaty of peace with the British at Gandamak. By the

terms of this treaty he was to receive a British resident, and on his side to obtain from the British government a subsidy and aid in case of foreign attack. The murder of Sir Louis Cavagnari, the resident, with staff and suite, occurred in the following September. Yakub was suspected of complicity. Lord Roberts (then Sir Frederick) defeated the Afghan force 6 October and seized Kabul on the 12th. Yakub abdicated and fled to the British camp. In December he was sent to India as a deposed ruler.

Yakutsk, yā kootsk', Asiatic Russia (1) A town of Eastern Siberia, capital of the government of the same name, on a plain surrounded by lofty heights, on the left bank of the Lena. The streets present a singular aspect, being composed of about 400 houses of European structure, standing apart, while the intervening spaces are occupied by winter yurts or huts of the northern nomads, with walls of cow-dung, earthen roofs, and doors covered with hairy hides. The principal buildings of the town are a large stone cathedral, other churches, a synagogue, a market-house, and several educational institutions. The trade is important, Yakutsk being the chief commercial emporium for the whole of Eastern Siberia. The principal articles of native produce are furs and fossil ivory, which are exchanged for European produce. Important fairs are held. Pop. about 8,000.

(2) The government of Yakutsk has an area of 1,517,696 square miles, or about two fifths of that of Europe. The surface is generally low in the north, but rises toward the interior, and in the south and east is covered by the Yablonoi or Stanovoi Mountains and their offshoots. A noteworthy feature of the country is the *tundras*, immense boggy plains, which stretch along the north. Farther south there are good pastures, and wheat and rye are successfully cultivated, even where the ground is frozen to a depth of 600 feet, the summer heat being strong enough to thaw it sufficiently deep for cultivation. There are a number of large rivers teeming with fish, the principal being the Lena. There are valuable forests in the south, frequented by numerous fur-bearing and other animals. Caravans with Chinese and European goods collect the produce of the whole line of coast on the Polar Sea between the parallels of 70° and 74°, from the mouth of the river Lena to the farthest point inhabited by the Tchukchia. The towns are chiefly inhabited by Turks and Cossacks, but the great body of the people are nomads, consisting of Yakuts, Tunguses, etc. Pop. about 270,000.

Yale, Elihu, English philanthropist: b. in or near Boston, Mass., 5 April 1648; d. London, England, 8 July 1721. His father was Thomas Yale, one of the original settlers in New Haven, Conn., in 1638, but who removed to Boston soon after and to England in 1651, followed by his family the next year. The son was educated in England, engaged in trade in India in 1672, and in 1687-92 was governor of the East India Company's fort at Madras. He returned to England in 1692 and although he never revisited New England he displayed his interest in the Collegiate School founded at Saybrook in 1700 by sending gifts of money and books to the amount of some £600 in 1715, 1718, and 1721. The largest gift, that in 1718, followed a suggestion from the college authorities that the college

YALE—YALE UNIVERSITY

building then being erected in New Haven might be named for him. In 1745 the whole institution received the name of Yale College in his honor. Yale's latest years were passed at Wrexham, Denbighshire, North Wales, and his body is buried in the magnificent parish church there.

Yale, Linna, American inventor: b. Salisbury, N. Y., 4 April 1821; d. New York 24 Dec. 1866. In 1851 he patented a safety lock, and for the rest of his life was a recognized authority on all matters pertaining to locks and safes. Becoming convinced of the necessity of abandoning the use of a keyhole as affording an easy means of introduction to the lock mechanism, he was led to the adoption of the permanent dial and shaft as used in the combination locks, and subsequently to the perfection of what is known as the "clock" lock. His most notable invention was the double lock, which comprised two locks within a single case, and was operated by the same or different combinations. He received gold, silver, and bronze medals as first awards at various expositions.

Yale University, located at New Haven, Conn. From the time of the first settlement of the New Haven Colony in 1636, the establishment of a college there was contemplated. It was not until 1700-1, however, that definite action was taken by 10 ministers of Connecticut, and a charter was obtained in 1701 for the establishment of the Collegiate School of Connecticut. This school was first located at Saybrook, but until 1707 the classes were taught at Kellingworth, a neighboring town, where the pastor, Abraham Pierson, was the first rector of the school. In 1716 the school was removed to New Haven, and in 1718, the name was changed to Yale College, in honor of Elihu Yale (q.v.), who had given largely to the Collegiate School. The first building was also completed in 1718. In 1745 a new charter was granted by which the full name of the corporation was The President and Fellows of Yale College. Until after the Revolution the college received occasional grants of money from the colonial government; in 1792 the State made a grant of about \$30,000, and the governor lieutenant and governor and six senators were made members *ex-officio* of the corporation. In 1795 Timothy Dwight (q.v.) became president, and during his administration the college attained a higher degree of prosperity than ever before; the college grounds were extended; permanent professorships were established, and the establishment of separate professional schools planned. The Medical School, however, was the only one established (1813) during President Dwight's lifetime. The Divinity School was organized in 1822, and the Law School in 1824, though instruction in theology had been given since the beginning of the college, and instruction in law for some years prior to 1824. The Sheffield Scientific School was established in 1847, and the School of Fine Arts in 1866. The elective system was adopted during the administration of Noah Porter, and from 1886-99 the college still further extended its course and doubled its number of students; the name was changed to Yale University in 1887. In 1872 provision was made by the State legislature for the substitution of graduates in the place of the six State senators in the corporation, so that the corporation now consists of 10 Congressional ministers, the successors of

the founders, six representatives of the alumni, the governor and the lieutenant-governor of Connecticut. In October 1901 the bicentennial anniversary was celebrated with appropriate ceremonies on the university grounds. There were 4,691 Yale graduates present at the anniversary ceremonies, and in addition, 311 former students, not graduates, and 147 holders of higher degrees from Yale. The President of the United States, and representatives from every leading American university and college, and from many foreign universities, were also present. The exercises included addresses by alumni and distinguished guests, a procession in which graduates and undergraduates took part, the "Dramatic" scenes in the history of the university given by the students' Dramatic Society, and the dedication of Woodbridge Hall, the administration building.

The university includes four departments—the Department of Philosophy and Arts, the Department of Theology, the Department of Medicine, and the Department of Law. In the Department of Philosophy and Arts are included the Academical Department of the college, the Sheffield Scientific School, the Graduate School, the School of Fine Arts, the Department of Music, and the Forest School. The University Library, the Peabody Museum of Natural History, the Observatory, and several other adjuncts to the university are organized independently of the separate departments. The undergraduate course in the college covers four years, and leads to the degree of A.B. To receive this degree the student must successfully complete courses aggregating 60 hours per week through a year; three courses which shall be a continuation of subjects offered for admission are required in the Freshman year. Otherwise the work is elective. The courses are arranged in three groups:

1. Language and Literature.
2. Mathematics and the Sciences.
3. Philosophy, History, and the Social Sciences.

Each student is required to complete two majors and three minors so arranged that not more than two of the five units shall be chosen from any one group. A major consists of connected courses of grades A, B and C, aggregating at least seven hours a week; a minor, of connected courses of grades A and B, aggregating at least five hours a week. The rest of the required number of hours are free electives. Sanskrit, Norwegian, Danish, and Swedish, and pedagogy are included in the curriculum. The Sheffield Scientific School was first organized in 1847, and received its present name in 1860; from 1863-92 it was the State College of Agriculture and Mechanic Arts, and received the national grants for such institutions. It offers undergraduate courses of three years; French and German, English, and general science are included in all courses, and the work of the Freshman year is much the same for all.

In the last two years the courses most distinctly marked out are in civil, mechanical, electrical, municipal, and sanitary engineering, in engineering preparatory to mining, in chemistry, in chemistry preparatory to metallurgy, in natural history, in mineralogy and other studies preparatory to geology, in biology preparatory to medicine, in studies preparatory to a forestry course, and in select studies preparatory to other

higher studies. The School of Fine Arts offers both technical courses and courses in art history and criticism; the regular course is three years in length for the completion of which a diploma is conferred. The degree of Bachelor of Fine Arts is conferred on the completion of certain advanced studies and the presentation of a thesis. The Department of Music offers both theoretical and practical courses. The degree of Bachelor of Music is conferred for the completion of advanced courses. The Yale Forest School was established in 1900; it offers a two years' course, the work of the second year being largely field work. The degree of Master of Forestry is conferred on those who have received a bachelor's degree or have had the equivalent of college training. A Summer School of Forestry is also maintained at Milford, Pa. The Graduate School was organized as a separate school in 1847, the professors of the other sections of the Department of Philosophy and the Arts constitute the faculty of the Graduate School. Graduate courses are offered in the Academic Department, the Scientific Department, the School of Fine Arts, and the Department of Music. The degrees conferred are A.M., M.S., Ph.D., C.E., and M.E. In addition to regular class and laboratory work of the school there are numerous voluntary associations of professors and students for the advancement of graduate work in the several departments of study. The Divinity School offers a regular course of three years leading to the degree of B.D. Seniors in the college may elect such courses in the Divinity School as to shorten the course to two years. A fourth year of graduate work is also provided. The work includes both prescribed and elective courses; elective courses in sociology, and in the study of missions, are included in the curriculum. The Medical School offers a four years' course leading to the degree of M.D. Ample provision for clinical work is made in the New Haven Hospital, the State Hospital for the Insane at Middletown, and the Springside Hospital. The Law School course covers three years. Previous to 1896 it was two years in length. The degrees of Bachelor of Laws and Bachelor of Civil Law are conferred, the same amount of work being required in each course. Students in the college may so arrange their course as to receive the degrees of arts and laws in six years. Graduate courses are provided, leading to degree of Master of Laws, and Doctor of Civil Law. The school was the first in America or England to establish a course leading to the latter degree.

Women are admitted to the School of Fine Arts, the Department of Music, and the Ph.D. courses of the Graduate School, and public school teachers are admitted to some of the regular courses. Numerous scholarships and fellowships are provided in the Academic Department, the Scientific School, the Divinity School, and the Graduate School. A "Bureau of Self Help" is maintained, through which students are aided in obtaining employment. The university maintains a public lecture course, and provides several series of lectures in the different departments; prominent among the latter are the Lyman Beecher lectures on preaching, the Silliman Memorial lectures, the Dodge lectures on the responsibility of citizenship, and the Bromley lectures on journalism, literature and public

affairs. The University Library in 1910 contained 600,000 volumes, exclusive of pamphlets. In addition there are several special libraries, including the Linonian and Brothers Library, the Dwight Hall Library, the Law Library, the Scientific School Library, the Trowbridge Reference Library of the Divinity School, the Lowell Mason Library of Church Music, the Library of Foreign Missions and several department and club libraries. The Peabody Museum was established in 1866 by a gift of George Peabody (q.v.) and contains excellent collections in mineralogy, geology and paleontology, and zoology.

Of the buildings of the university, Dwight Hall, Alumni Hall, Durfee Hall, Battell Chapel, Farnam Hall, Lawrence Hall, Phelps Hall, Welch Hall, Osborn Hall, Vanderbilt Hall, Art School, the Library, and South Middle College, are grouped about the college campus, which is rectangular in shape. In another group to the north are the bicentennial buildings, built largely by the alumni at the time of the anniversary; these are Woodbridge Hall, Woolsey Hall, Memorial Hall, and University Hall. The gymnasium is situated to the northwest of the college campus, near the Peabody Museum, Herick Hall, White Hall, and Pierson Hall. The Scientific School occupies seven buildings, lying northeast of the bicentennial buildings. The Divinity School lies to the south of this group. Hendrie Hall (the Law School) lies east of the main campus, facing the Green. The Medical Hall and the Medical School Laboratory lie to the west of the campus, the University Clinic Building is opposite the New Haven Hospital; the Forest School occupies Marsh Hall, the house of the late Professor Marsh, in the Botanical Gardens. The athletic field of 30 acres is situated about a mile from the campus. The students maintain a Christian Association, an Athletic Association, numerous literary, dramatic, and technical societies, and social, and special literary and technical clubs. A chapter of Phi Beta Kappa is also located at Yale. Yale has long taken a prominent part in inter-collegiate athletics, and general physical training is given full attention. The students in 1910 numbered 3,287, including those in attendance at the Scientific School, the Medical School, and the Law School, as well as at the College. The faculty numbered 406.

Yale ranks as one of the leading American universities, in number of students, standards of scholarship and in the influence exercised through her graduates on national life.

CHARLES HENRY SMITH,
Learned Professor of American History.

Yalu, ya'loo, Korea, a river forming the boundary with Manchuria. In its upper reaches it is known as the Am-nok or Ap-nok. Its source is in the Paik-tu-san, the highest peak (8,000 feet) of the Shan-a-lin Mountains of Manchuria. It flows into Korea Bay, near Wi-ju, after a southwesterly course of about 300 miles, and has numerous tributaries, chief of which is the Chang-jin River. It is navigable for sea-going vessels 30 miles from its mouth and by smaller vessels 145 miles to Wi-wen. On 17 Sept 1894 its mouth was the scene of the battle in which a Chinese fleet of 12 warships, some of them powerful ironclads, and 16 other vessels, was defeated, with the loss of four vessels, by a Japanese force of 11 war vessels and two

others. During the Russo-Japanese war of 1904 its banks witnessed much skirmishing and fighting. See MANCHURIA.

Yam, a popular name for various species of the genus *Dioscorea* of the order *Dioscoreales*, and loosely applied to certain varieties of the sweet potato. The true yams belong to a genus consisting of more than 150 species widely distributed throughout the tropics. They have herbaceous, twining or creeping stems; broad, alternate or opposite, usually simple leaves; and small dioecious flowers, followed by three-winged capsular fruits containing winged seeds. The fleshy roots of some species are widely eaten in the tropics. One of the best known species is *D. alata*, a native of India and the South Sea Islands, but distributed throughout the tropics. Its tubers usually attain a length of three feet and a weight of 30 pounds, but specimens three times as large are not uncommon. They are black or brownish externally and pink within, and are rich in starch. When boiled their acidity is dispelled and they become of pleasant flavor. It is claimed that this species is the parent of most of the edible so-called species such as *D. sativa*, *D. aculeata*, *D. rubella*, *D. globosa*, etc. The air-potato (*D. bulbifera*) is an Asiatic species cultivated to a small extent in the southern United States, and in conservatories, for its odd, angled tubers, which are borne in the axils of the leaves. They often exceed two pounds in weight and are sometimes eaten like potatoes. The Chinese yam, Chinese potato, or cinnamon vine (*D. diuricata*), is a native of the Philippine Islands, whence it has been introduced into the gardens of temperate as well as tropical climates for ornament. It bears cinnamon-scented white blossoms, aerial tubers which are used for propagation. As far north as New York the plants have proved hardy.

Yam-a-mai, an Oriental kind of silkworm which feeds on the oak, and produces a silk with peculiar, but useful qualities, extensively utilized in Japan and somewhat elsewhere. See SILKWORM.

Yama, *yā-mā'*, a Hindu god, the judge of the dead, whose good and bad actions are read to him out of a record, and who according to their merits and demerits are sent to the celestial or to the infernal regions. Hindus offer to him daily oblations of water. See also LAMAISM.

Yamagata, *yā-mā-gā'tā*, Aritomo, MARQUIS, Japanese soldier and statesman: b. Chōshū (or Nagato) province 1838. He was active in the overthrow of the shogunate, and was made second vice-minister of war under the new government. In 1869 he visited Russia and France for study of their military institutions. In 1876-7 he ably directed the Satsuma rebellion campaign, in 1878 was made commander of the imperial guard and chief of the general staff. He was prime-minister in 1889-91, in which post he greatly strengthened the army and navy; and minister of justice in 1891-3. He was appointed to command the first army corps in the war with China in 1894, and quickly expelled the Chinese from Korea. His policy was throughout one of study of Western methods. He was a skilful strategist, and was for his services made field-marshal.

VOL. 22—37

Yamagata, Japan, a town in the island of Honshū, capital of a prefecture, 200 miles north of Tokyo.

Yamaguchi, *yā-mā-goo'chē*, Japan, city, capital and chief city of the prefecture of Yamaguchi, in the southwestern part of the island of Honshū; 15 miles back from the coast. It was formerly the residence of the lords of Chōshū, a Mori family, and became the seat of the local government in 1860. In 1550 a church was established here by Francis Xavier, but was finally destroyed.

Yamaji, *yā'mā-jē*, Motobaru, VISCOUNT, Japanese soldier: b. Tosa province, island of Shikoku, about 1840. He won distinction in the campaign against the unsuccessful revolt in Satsuma province (island of Kiu-siu) in 1877; and was promoted lieutenant-general. In the Chinese-Japanese war of 1894-5 he had the immediate direction of the attack on Port Arthur, which was finally taken on 22 Nov. 1894. This won for him a great reputation in Japan, where, in allusion to his loss of an eye, he is known as the "One-Eyed Dragon."

Yamanou'chi Gun. See ORDWANCE.

Yamaska, *yā-mās'ka*, Quebec, Canada; (1) a village and railway junction of Yamaska County, on the Yamaska River, 31 miles north of Saint Hyacinthe. The river affords power for several mills. Pop. about 900. (2) A county bordering on Lake Saint Peter; area, 183,705 acres. Capital, Saint François du Lac. It is drained by the Yamaska, Nicolet, and Saint Francis rivers. Pop. about 18,000. (3) A river flowing from Brome Lake, Brome County, and after a course of about 100 miles through a fertile country, draining into the Saint Lawrence River at Lake Saint Peter.

Yambo, *yām'bō*, **Yambu**, *yām'boo*, or **Yembo-El-Bahr**, *yēm'bō-ēl-bār*, Arabia, a seaport town on the Red Sea, in the province of Hedjaz, 131 miles east of Medina, of which it is the harbor. Marking the end of the third quarter of the caravan journey from Cairo to Mecca, the town bears the title "Gate of the Holy City." The town consists of a long row of white houses built of limestone and coralline, standing on the edge of an arid plain. It has considerable imports and transit trade between Suez, Jidda, and Medina. Pop. est. 7,000.

Yana ("people"), a small tribe, forming the Yana linguistic stock of North American Indians, whose former habitat was bounded on the east by a mountain range a little west of Lassen Butte, and terminating near Pit River, in northern California; on the north by a line running northeast to southwest, passing near the northern side of Round Mountain, three miles from Pit River; on the west by a line extending from Redding southward on an average 10 miles to the eastward from Sacramento River; north of Redding it approximates twice that distance. The tribe and stock were represented in 1884 by 35 individuals divided into two groups—one at Redding, the other in their original country at Round Mountain. They have a tradition to the effect that they came from the East, and it is said that in physical traits they differ markedly from all the northern California Indians.

Yana, *yā'nā*, or **Jana**, Eastern Siberia, a river which rises in the Verkhoyanskii Moun-

YANCEY

tains, and after a northerly course of about 750 miles enters the Arctic Ocean, near Ustjansk, by seven large and many small mouths.

Yancey, yán'sí, William Lowndes, American lawyer, orator, and statesman: b. Falls of Ogeechee, Hancock County, Ga., 10 Aug. 1814; d. near Montgomery, Ala., 27 July 1863. He was the son of Benjamin Cudworth Yancey of Charleston, S. C. His mother was a daughter of Col. William Bird, a descendant of the historic family of "Birdsville," Pennsylvania. The Yanceys were landed proprietors of Virginia in the time of Charles II., and the Cudworths were New England people, devoted patriots in the Revolution. Capt. Joseph Yancey fell at Eutaw Springs, and Maj. James Yancey of the Virginia Continental forces, having come to South Carolina with General Nathaniel Greene, settled there after the war, and became a lawyer and statesman. Benjamin Cudworth, the father of William, was the son of James. As midshipman he had fought the French under Truxton. Yancey's first recourse to attain influence in Federal affairs was in an election to the House of Representatives of Congress. He was successful under a most flattering vote of an Alabama district in 1844 at a special election to fill an unexpired term. The next year he was returned to office without opposition. Yancey resigned at the close of the Twenty-ninth Congress, in the summer of 1846, because he had discovered that any movement which might be necessary to save the South in possession of slavery must come from the people direct without the intervention of their representatives in Congress. He returned to his law office at Montgomery, persistently refused public office and eagerly entered upon the self-appointed tribuneship, the task of educating and animating the Southern masses in the principles of States rights.

The candidature of General Zachary Taylor as the nominee of the Whigs for President of the United States, in 1848, proved a disturbing influence in the Democratic State of Alabama. The long-prostrate Whigs were quick to seize the occasion. In January 1848, they invited all persons favorable to General Taylor's election to assemble at Montgomery in convention. Democrats of high position in party politics answered to the summons. In the next month, the customary State Convention of the Democratic party met at the same place to appoint delegates to the approaching quadrennial National Democratic Convention to meet at Baltimore. In the action of this State Convention Yancey attained to national reputation that never waned. With tact and intellectual prowess he then and there laid the predicate of that agitation which accepted his personal leadership as long as he lived. In anticipation of this meeting, he prepared at his law desk the resolutions that he intended the Democrats of Alabama should present for ratification at the Baltimore Convention. The usual committee on resolutions brought into the State Convention its report. Yancey rose on the floor, drew from his pocket his own substitute, read what he had written, spoke 45 minutes to his own motion, and without a dissenting voice carried it. The substitute was adopted and remained before the country, the pivotal question of Federal politics, until the election of Abraham Lincoln

to the Presidency, in 1860, in token of the final adverse settlement of the proposition set forth by it. The few pages of manuscript that Yancey read of his own construction became the "Alabama Platform." It was not in the nature of suggestion, that the laws of Alabama should go to the common domain to protect the property of Alabama settlers there; but that the laws of Massachusetts should not be permitted to deny to Alabama settlers on the common domain their rights of property as secured by the Federal Constitution. Number 9 of the Yancey resolutions declared: "That the [pending] treaty [with Mexico] should contain a clause securing an entry into those [conquered] territories to all citizens of the United States, together with their property of every description, and that the same should remain protected by the United States while the territories shall continue under its authority."

Yancey was appointed by the Convention the leader of its delegation to Baltimore; the National Democratic Convention refused the principle of the Alabama Platform. Yancey withdrew from participation in its proceedings, returned to Alabama and took the field against General Cass, the Democratic nominee for President. Without advocating Taylor's election he proclaimed from a hundred "stumps" the peril of the cause of the South in support of Cass.

The people of Alabama declined Yancey's advice, in 1850, to secede from the Union. He bided his time, speaking and writing industriously his unflinching sentiments. In 1856 he succeeded in accomplishing the re-organization of the State Democratic party, opening its doors to all who would follow him. Under the spell of his eloquence, the Alabama Democratic Convention of that year re-adopted the Alabama Platform as prepared by him in 1848 and sent it with gratifying results to the quadrennial National Democratic Convention at Cincinnati. As the head of the electoral ticket he canvassed the State, for the first time, for Buchanan and Breckenridge and fixed upon immovable foundations his influence in the generation about him. When Yancey took his seat in the Charleston National Democratic Convention of 1860, he was the acknowledged leader of the South. He was selected by the 15 Southern States in a body to speak for them in argument with the Northern States. He spoke and the Convention was disrupted and the party virtually dissolved, but Yancey desired neither the disruption of the Convention nor the dissolution of the party. He did not expect the election of a Democrat of either faction, Northern or Southern, to the Presidency, even if the factions should unite. The 16 Northern States, that already had Republican State governments and that controlled the election, were not likely to choose Democratic Presidential electors. Yancey looking forward at Charleston to the election of the Republican party candidate to the Presidency, anxiously desired to see the South united in opposition, pending the campaign, to the end that the longed-for Southern Confederacy might be made more sure at the close of the campaign.

Yancey entered the North in the last months of the Presidential campaign of 1860. He spoke at Cooper Institute, at Albany, Syracuse, and Rochester, and at Faneuil Hall. Ostensibly the object of his oratory was to turn opinion to

W. L. YANCEY.

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YANG AND YIN—YANKTON

Douglas as the compromise candidate for the Presidency; really he spoke to present to the people of the North finally the Southern argument of self-defense. His audiences, always numbered by the capacity of the hall, were in the main friends of Lincoln. Streets were lighted in his honor, houses were decorated, long processions escorted him. The impression of his oratory was phenomenal. On the night of 20 October he appeared in the last of his Northern appointments at Pike's Opera House, Cincinnati. A grave editorial notice of the event appeared in a local and unfriendly newspaper of the first class the next morning: "Pike's Opera House was crowded to its utmost capacity last evening and contained probably the largest audience ever within its walls, to listen to an address from the Hon. William L. Yancey of Alabama. The notoriety of the man, his great agency in promoting the disruption of the Charleston and Baltimore Conventions, the novelty of hearing one entertaining his extreme views on the slavery question, together with his powers as an orator, would naturally draw him a great audience in this city. . . . His address was about two hours and was listened to with the most profound and marked attention."

Yancey was appointed by President Jefferson Davis immediately upon the organization of the Confederate government, in February 1861, president of a commission of three to the states of western Europe, to seek the recognition of the Southern government. He accepted the post reluctantly. Yielding his will, he desired to be instructed to offer to England and France, unitedly or singly, special privileges of commerce in the Confederate ports for a long period, not less than 20 years, in return for the act of recognition of either or both. In his absence on the foreign mission he heard of his unanimous election to the Senate of the Confederate States and having despaired of effecting good in Europe while denied the instructions from his government that policy suggested, he returned to Alabama. Yancey's service in the Senate of the Confederate States continued as long as he lived. He bitterly resented the inefficiency of the government of President Davis. He urged a war of invasion from the South upon the North, the shipment of all the cotton in the South to Europe, the importation of European arms and supplies without limit at a time when the blockade by the United States was known to be ineffective.

JOHN WITHERSPOON DU BOIS,
Author of 'Life and Times of Yancey.'

Yang and Yin, in Chinese philosophy, terms employed to indicate the two phases under which the supreme principle of the universe, *Tai-ki*, displays itself in the world of phenomena, Yang and Yin being, in various proportions, blended in all forms of existence.

Yang-tse-kiang, yāng'tsǎ-kě-āng, the name generally given to one of the greatest rivers of China throughout its entire course, although this name is only applied in China to the lower course of the river, the entire river being called simply Kiang, or Ta Kiang (river or great river), while in the various provinces it traverses it is generally known by special names. It rises in the Tangle Mountains in mid-Tibet, about lat. 35° N. and lon. 89° E., and is first known by the name of Muru-Ussu. In its upper course

it is sometimes called the Kin-cha-kiang. Its upper course through the mountainous region of Tibet extends to about 1,100 miles, during which its windings and falls present numerous striking scenes of natural beauty. It crosses the Chinese frontier in the province of Yunnan. Between the town of Li-kiang in this province, and Hui-li in Sze-chuen, for a course of about 250 miles, it flows in an easterly direction through a winding channel or mountain gorge of imposing grandeur. Traversing the whole province of Sze-chuen in a northeasterly direction, and passing in southeasterly direction into the province of Hu-pei, it reaches at King-chau the great Chinese plain, and traversing the provinces of Ngan-hui and Kiang-su, and passing the cities of Han-Yang, Han-kau, and Wu-chang, a great seat of the tea exporting trade, Ngan-king, Nanking, and Chin-kiang, it enters the Tung-hai, or Eastern Sea, above Shanghai. Its direct course from its source to its mouth is estimated at 1,800 miles; its course with windings is about or considerably over 3,000. It receives numerous affluents, and is crossed by the Grand Canal, which forms a junction between it and the Hoang-ho. The river and the ports of Chin-kiang and Han-kau were opened to foreign navigation in 1860, I-chang (1,000 miles up), and others since. A British squadron sailed up the river in 1861 for more than 800 miles. The navigation above the confluence of the Tung-ting is interrupted by rapids. The tidal influence reaches in February to Lake Poyang, 436 miles from the sea. Consult Little, 'Through the Yang-tse Gorges' (1898).

Yankee, a cant name for Americans belonging to the New England States. During the Revolution the name was applied by the British to all the insurgents; and during the Civil War it was the common designation of the Federal soldiers by the Confederates. In Great Britain the term is sometimes improperly applied generally to natives of the United States. The most common explanation of the term seems also the most plausible, namely, that it is a corrupt pronunciation of English or of French *Anglais* formerly current among the American Indians.

Yankee Doodle. The air of Yankee Doodle is said to have been a British air known in the time of Cromwell by the name of Nankee-Doodle, and played with derisive reference to the similarity of this name to Yankee by the British troops in evacuating Boston. The Americans took it up and made it their national air. It has since been superseded by 'Hail, Columbia.' See NATIONAL SONGS.

Yankee Gang, a term used in sawmills for an arrangement adapted for logs 21 inches diameter and under. It consists of two sets of gang saws, having parallel ways in the immediate vicinity of each other. One is the slabbing gang, and reduces the log to a balk and slab boards. The balk is then shifted to the stock gang, which rips it into lumber.

Yank'ton, S. Dak., city, county-seat of Yankton County; on the Missouri River, and on the Chicago, M. & St. P., the Great Northern, and the Chicago & N. R.R.'s; 60 miles northwest of Sioux City and 135 miles northwest of Omaha, Neb. It has steamer connection with the Missouri River ports. The city is the commercial and industrial centre of a

YANKTON COLLEGE—YARMOUTH

large agricultural and stock-raising region. The chief industrial establishments are Portland-cement works, breweries, pork-packing establishments, flour mills, woolen mills, brick yards, grain elevators, and stock yards. The city owns and operates the water-works. The educational institutions are Yankton College (Congregational), opened in 1882, Saint Joseph's Academy, a public high school, public and parish elementary schools. It has the South Dakota Hospital for the Insane and a hospital in charge of the Sisters of Saint Benedict. Yankton's water supply is obtained partly from artesian wells. There are two national banks, one State, and the American Mortgage Company; the four have a combined capital of \$175,000. The government is administered under a revised charter of 1885 which provides for a mayor, who holds office one year, and a council. Yankton was settled by Eastern people in 1862, and in 1883 received a city charter. Until 1883 it was the capital of the Territory of Dakota. Pop. (1890) 3,670; (1900) 4,125, (1910) 3,787.

Yankton College, located at Yankton, S. Dak. It was established by the General Association of Congregational Churches of Dakota in 1881, and opened to students in 1882, and is the oldest institution of higher learning in the Dakotas. The majority of the corporate body which elects the trustees must be members of Congregational churches; otherwise the college is non-sectarian. It is open to both men and women. The organization includes the following departments: (1) the College; (2) the Academy; (3) the Conservatory of Music; (4) the Department of Art; (5) the Department of Elocution; (6) the Department of Physical Training; (7) the Department of Stenography. The college offers three four years' courses, the classical, the philosophical, and the scientific, leading to the degrees of B.A., B.Ph., and B.S. respectively. The work of the freshman year is required in all courses; elective work begins in the sophomore year and increases progressively in the junior and senior years. Greek is required for the A.B. degree; one course in Bible study is required of all students, and there are other elective courses; courses in pedagogy are included in the curriculum. The Conservatory of Music offers courses of three to five years in pianoforte, pipe organ, voice, and violin. The course in stenography covers one year. Gymnasium work is required of both men and women, and there is also an athletic park, and ample provision for athletic sports. The students maintain Young Men's and Young Women's Christian associations, literary societies, a branch of the Inter-Collegiate Oratorical Association, and athletic associations. The college has an attractive campus of 25 acres, including the Athletic Park (five acres) to the north of the main campus, and Observatory Hill to the south. The buildings are Middle College, Dakin Hall, the Ward Hall of Science, Clarke Observatory, and the gymnasium: a new library building, the gift of Andrew Carnegie, was constructed during 1904. A Summer School was established in 1903. The students in 1910 numbered 351, of whom about 100 were in the College; others attending the Conservatory of Music in the Summer School.

Yapock, a small, rat-like marsupial (*Achironectes variegatus*) of the opossum fam-

ily (*Didelphidae*), which is found in Central and South America. It is rather larger than a common rat, with large, naked ears, and a long, nearly naked, tail; fur brown above, with three transverse bright gray bands, interrupted in the middle, white below. It differs from the opossums in having webbed hind feet and being an expert swimmer and diver. Its habits closely resemble those of the otter, and it feeds on fish, crabs, and other aquatic animals.

Yapura, *yā-poo-rā'*, or *Japura*, *zhā-poo-rā'*, a river in Colombia and Brazil, South America, a tributary of the Amazon. It is about 1,800 miles long; and fully one half its course is navigable for steamers. At lat. 1° 10' S. and lon. 72° 30' W. navigation is interrupted by a large cataract.

Yard, (1) As a nautical term, a spar slung from a mast and serving to extend a sail. Yards are either square, lateen, or lug sail. Yards for square sails are suspended across the mast at right angles, and are of a cylindrical form, tapering from the middle, which is termed the slings, toward the extremities, which are called the yard arms. (2) A standard measure of length, equal to three feet or 36 inches, the foot in general being made practically the unit. As a cloth measure the yard is divided into four quarters=16 nails. A square yard contains nine square feet, and a cubic yard 27 cubic feet. See WEIGHTS AND MEASURES.

Yarkand, *yār-kānd'*, Central Asia, (1) A city of Eastern or Chinese Turkestan, situated on a fertile plain on the north side of, and at a little distance from the river Yarkand, about 200 miles southeast of Kashgar. It is enclosed by a ditch, and a thick mud wall with towers at intervals. The houses in general are built of sun-dried bricks. Those of the rich are in large open squares surrounded by high walls and well stocked with fruit-trees. The streets are in general too narrow to permit carts to pass. They are intersected by numerous canals, and where three or four streets meet there is always a tank for water. There is a large covered bazaar wide enough to admit carts. The inhabitants, like those of Kashgar, are very mixed in regard to race. The prevailing religion is Mohammedanism. There are 120 mosques and some caravanseries. During the period in which Eastern Turkestan was severed from China a commercial treaty was concluded at Yarkand in 1874 between Sir Douglas Forsyth, representing Great Britain, and Yakub Beg, who was then the independent ruler of Eastern Turkestan. Commercial intercourse with India sprung up in consequence. The chief trade at present is carried on with Russia. Estimated pop. 80,000 to 120,000. (2) A river of Eastern Turkestan, which rises in the Karakoram Mountains, flows generally in a northeast direction and unites with the Kashgar to form the Tarim. The Tarim flows east and enters the Lob Nor Lake, or series of shallow lakes.

Yarmouth, *yār'mūth*, Canada, a town and port of entry of Yarmouth County, Nova Scotia; on the Bay of Fundy, the Atlantic Ocean, and the Dominion Atlantic Railroad; 90 miles south of St. John, N. B. The town has extensive fishing, shipping, and manufacturing interests, electric lighting, and street railways. At the head of its educational institutions is Yarmouth Seminary.

YARMOUTH—YARROW

Yarmouth, Maine, town in Cumberland County; on Casco Bay, the Royals River, and on the Grand Trunk Railroad; 10 miles north-east of Portland. It contains four villages. It has a foundry, paper and cotton mills, and granite quarries. The town has six churches, North Yarmouth Academy, a high school, graded schools, and a public library. Pop. (1910) 2,350.

Yarmouth, Great, England, a seaport town in the county of Norfolk, 22 miles east of Norwich, on a narrow slip of land between the Yare and the sea, and connected by a bridge over the Yare with Little Yarmouth, or South Town, in Suffolk. The older part, near the river, is remarkable for the number of narrow lanes at right angles to the main streets, known as the "rows." Between the older part of the town and the sea is the modern part, with a marine parade and other attractions. The parish church, founded in 1101, is a very large building, and the market-place is also of great size. There are a fine town-hall, a large custom-house, a fine library and museum, borough jail, a lofty Nelson monument, royal hospital, royal naval lunatic asylum, aquarium, two fine piers, and an ancient jetty. The quay stretches along the river upward of a mile. The harbor is in the Yare, and is accessible by vessels drawing 18 or 19 feet. Immediately off Yarmouth, and parallel to the shore, is a great range of sand-banks, between which and the land is the safe anchorage of Yarmouth Roads. Yarmouth is a great seat of the English herring-fishery, in which about 300 vessels and 3,000 hands belonging to the port are employed; many hands are likewise engaged in the mackerel fishery, and in that for cod and other whitefish. Many of the fish are cured, the cured herrings known as "Yarmouth bloaters" being celebrated. There are maling-houses, boat-building yards, rope-works, silk-crape factories, trawl-net works, etc. Yarmouth has risen into considerable importance as a watering-place.

Yarn, any textile before woven into cloth. Cotton yarn is numbered according to the number of hanks contained in a pound of 7,000 grains. Each hank, or skein, measures 840 yards. Worsted yarn has 560 yards to the skein; woolen yarn has 1,600 yards to the skein or run. Linen yarn is wound upon reels, and made up into leas, hanks, and bundles. Flax and jute yarn is numbered according to the number of leas of 300 yards per pound.

Yaroslavl, yā-rō-slāv', or Jaroslav, Russia, (1) a city, capital of the province of Yaroslavl, at the confluence of the Kotorost and Volga rivers, 173 miles northeast of Moscow. It is the see of an archbishop. The Uspenskij Cathedral was begun in 1215, and there are numerous other old churches, several monasteries, schools, gymnasias, a theological seminary, and a lyceum with a law faculty. The left bank of the Volga is the suburban and residential portion of the city and contains many beautiful dwellings. The city is largely engaged in manufacturing and commerce, the right bank of the Volga being lined for two miles with quays. There are numerous cotton and linen mills, silk factories, and bell foundries. The village of Velikoje Selo, included in the city, is the centre of the linen manufacture of Russia, and has an annual output valued at \$3,000,000. Pop. about 80,000.

(2) The province has an area of 13,751 square miles, and is bounded by the provinces of Novgorod, Vologda, Kostroma, Vladimir, and Tver. The surface is level and well watered by the Volga and its tributaries, the Mologa and Sheksma. The western portion has numerous ponds and marshes, the largest being Lake Nero, near Rostov, from which the Weska flows. The Volga is connected with the Neva by two canals, through which considerable commerce is carried on. Market gardening, timber cutting, mining, and manufacturing are the chief occupations. There are extensive linen and cotton mills, and factories for the manufacture of chemicals, machinery, metal ware, flour, tobacco, and spirits, making Yaroslavl one of the principal manufacturing provinces of Russia. Considerable commerce is carried on by the two railway lines, the Rybinsk-Saint Petersburg and the Yaroslavl-Moscow-Vologda.

Yarra-Yarra, yā-rā-yā-rā, Australia, the river of Victoria on which Melbourne (q.v.) stands. It is about 100 miles long, but is not navigable above Melbourne, owing to its falls.

Yarrell, yār'el, William, English naturalist: b. London June 1784; d. Yarmouth, Norfolk, 1 Sept. 1856. Led to note carefully the habits of birds and fishes in 1825 he sent his first contribution to the 'Zoological Journal,' a notice of some rare British birds observed in the years 1823-5. The same year he became a member of the Linnean Society, to whose 'Transactions' he repeatedly contributed interesting papers on the subject of birds, and in 1849 became its vice-president. His chief work is his 'History of British Birds' (1839-43, 4th revised edition 1881-5). He also published 'The History of British Fishes' (1835-6).

Yarrow, yār'ō, Harry Crécy, American physician: b. Philadelphia, Pa., 19 Nov. 1840. He was graduated from the medical department of the University of Pennsylvania in 1861, and during the Civil War served as surgeon of the 5th Pennsylvania cavalry. He was surgeon and naturalist in the expedition to explore the territory west of the 100th meridian, and has been acting assistant surgeon of the United States army for more than 30 years. He is the author of 'Introduction to the Study of Mortuary Customs Among North American Indians,' and various biological and ethnological monographs.

Yarrow, Scotland, a celebrated pastoral stream in Selkirkshire, which rises at Yarrow Cleugh, and, running east a few miles, forms a beautiful lake, called the Loch of the Lowes, which discharges its water into St. Mary's Loch. Issuing from the latter, the river, after a course of 16 miles through the district of Ettrick Forest, flows into the Ettrick near Selkirk. It is famous in Scottish song, and has been celebrated in poems by Scott, Wordsworth, and others.

Yarrow, an erect, hairy composite herb (*Achillea millefolium*), sometimes called milfoil. The terminal corymbs of small white, or occasionally rose-colored flowers, are large, compound, and fastigiate. The leaves are from two to four inches long, and are cut into numerous fine segments, which are very pubescent. Yarrow is a common plant of roadsides, and has been introduced from Europe. It has been used for a long time as a tonic and astringent, and

enters into an ointment for dressing wounds. Several species of *Achilles* are garden plants. Sprigs of yarrow plucked from a young man's grave, by love-sick maidens, who repeat meantime a mystic formula, are expected to invoke the images of their lovers, in dream.

Yarumal, yā-roo-māl', Colombia, a town in the department of Antioquia, on the Cauca, 50 miles northeast of Medellín. Gold mining and stock-raising are the chief industries. Pop. est. 9,000.

Yataghan, yāt'a-gān, the Turkish name for a sort of dagger-like sabre with double-curved blade, about two feet long, the handle without a cross-guard, much worn in Mohammedan countries.

Yates, yāts, **Edmund**, English journalist and author: b. Edinburgh 3 July 1831; d. London 20 May 1894. After a secondary education he obtained a post in the secretary's department of the general post-office (1847), and in 1862 became head of the missing-letter department. Meanwhile he was also active in various literary work,—writing dramatic critiques for the 'Court Journal' and the *Daily News*, contributing to numerous periodicals, editing short-lived humorous journals ('Comic Times,' 'The Train'), and doing some successful farces. In 1858 he became editor of 'Town Talk,' in which he soon made an attack on Thackeray which resulted in his expulsion from the Garrick Club; in 1860 acting editor of 'Temple Bar,' of which he was editor-in-chief in 1863-7; and for a time was also editor of 'Tinsley's Magazine.' Among his subsequent ventures were 'Time: A Monthly Miscellany' (1870-84), and 'The World.' He lectured in the United States in 1872, and in that year withdrew from the post-office department. The best of his works in fiction are probably 'Broken to Harness' (1864), originally published in 'Temple Bar,' and 'Black Sheep' (1867); His 'Edmund Yates: His Recollections and Experiences' (1884; 4th ed. 1885) contains much interesting material.

Yates, **Lorenzo Gordin**, American naturalist: b. England 8 Jan. 1837. He came to the United States in 1853, and after teaching in Wisconsin, he later studied medicine and dentistry. He served in the geological survey of California under Prof. J. D. Whitney (q.v.), and had charge of the scientific department of the Froebel Institute, Los Angeles, Cal. He has published 'California Digest of Masonic Law' (1867); 'Charm Stones' (1866); 'The Ferns of Ceylon' (1887); 'Notes on Hawaiian Ferns' (1887); 'The Channel Islands' (1890); 'The Mollusca of Santa Barbara County and New Shells from the Santa Barbara Channel' (1890); 'All Known Ferns'; 'Aboriginal Weapons of California' (1900); 'Prehistoric California' (1903).

Yates, **Richard**, American politician: b. Warsaw, Ky., 18 Jan. 1818; d. St. Louis, Mo., 27 Nov. 1873. He was graduated at Illinois College, Jacksonville, in 1838; practised law at Springfield, Ill., sat in the State legislature 1842-9, and was sent to Congress as a Whig in 1850. In 1860 and 1862 he was governor of Illinois. He was a strong opponent of slavery, and an ardent supporter of the government during the Civil War, taking an active part in the organization of volunteer regiments. He

was United States Senator in 1865-71, and afterward United States railroad commissioner.

Yates, **Richard**, American politician, son of the preceding: b. Jacksonville, Ill., 12 Dec. 1860. He was graduated from Illinois College in 1880 and from the law department of the University of Michigan in 1884. After being city attorney of his native place, 1885-91, he was county judge of Morgan County, Ill., 1894-7, and collector of internal revenue at Springfield, Ill., 1897-1900. In 1901 he was elected governor on the Republican ticket of Illinois for the term ending 1905.

Yates, **Robert**, American statesman and jurist: b. Schenectady, N. Y., 17 March 1738; d. Albany 9 Sept. 1801. He was educated and studied law in New York, and after his admission to the bar (1760) settled in Albany, where at the commencement of the Revolutionary troubles he was a member of the committee of public safety (1775). In 1775-7 a member of the provincial congress of New York. He was a member of the convention that framed the constitution of the State (1776), in 1777 was appointed judge of the supreme court of New York, and in 1787 was a member of the convention that framed the Constitution of the United States. His notes of the secret proceedings and debates of this convention were printed after his death (1839). In 1790 he was appointed chief justice of the State of New York. On his retirement from the bench in 1798 he was appointed a commissioner to settle disputed titles to lands in the 'Military Tract' with Massachusetts and Connecticut.

Yates, **William**, English Baptist missionary: b. Loughborough, Leicestershire, 15 Dec. 1792; d. at sea 3 July 1845. He studied for the Baptist ministry at Bristol College, was ordained in 1814, and sailed for Calcutta the next year. He settled at Serampore, preaching for a time and subsequently devoted himself entirely to translation. He translated the whole Bible into Bengalee; the New Testament, the Pentateuch, Job, the Psalms, the Proverbs, the Song of Solomon, Ecclesiastes, Isaiah, and Daniel into Sanskrit; and the New Testament into Hindee and Hindustanee. He also prepared in Sanskrit a dictionary, grammar, vocabulary, several school books, and an expurgated edition of the 'Hitopadesa' and 'Nalodaya,' numerous school books in Hindee, Hindustanee, Arabic, and Bengalee; and translations of Bunyan's 'Pilgrim's Progress' and Baxter's 'Call to the Unconverted.'

Yates Centre, Kan., city, county-seat of Woodson County; on the Missouri Pacific and the Atchison, T. & S. F. R.R.'s; about 90 miles east by north of Wichita. It is in a productive farming region. It has industries connected with farm and dairy products, stock-raising, and marketing of wheat, corn, and fruit. There are six churches, a high school, graded elementary schools, and a school library. It has two banks, one national and one state. Pop. (1890) 1,305; (1900) 1,634; (1910) 1,910.

Yawl, a small ship's boat, usually rowed by four or six oars; a jolly-boat; also a sailing boat similar to a cutter, but having a small sail at the stern.

Yawning, or **Gaping**, an involuntary and wide opening of the mouth and inhalation of

YAWS—YAZOO CITY, MILITARY OPERATIONS

breath, generally produced by weariness or an inclination to sleep, sometimes by hunger, sympathy, etc. It often precedes the fit in some intermittent fevers, hysteria, and spasmodic asthma, and in some instances, by the frequency of its recurrence, becomes a real disease. Persons suffering from heart disease may be liable to yawning fits. It is supposed by some to be determined by an interruption of the pulmonary circulation. Yawning is performed by expanding the chest, by extending the lungs, by drawing in, gradually and slowly, a large quantity of air, and gradually and slowly expiring it after it has been retained for some time, the muscles of the chest being restored to their natural state. Its effect upon the muscles brought into play is sometimes very restful. When yawning is troublesome, long, deep respiration, or drawing in the air at long intervals, relieves it. It often seems "contagious."

Yaws, a disease occurring in Africa, America, Samoa, Java, and tropical regions in many parts of the world. It is almost wholly confined to the African races. It is characterized by cutaneous yellowish tumors, numerous and successive, gradually increasing from specks to the size of a raspberry, one at length growing larger than the rest; core a fungous excrescence; fever slight, and probably irritative merely. It is contagious, and cannot be communicated except by the actual contact of yaw matter to some abraded surface, or by inoculation, which is sometimes effected by flies. It is also called *frambesia*, from the French *framboise*, a raspberry. Some regard it as a form of syphilis.

Yazd, yâzd. See **Yazm.**

Yazoo, yâ'zoo (an Indian word meaning "River of Death"), a river in Mississippi, formed by the junction of the Yallobusha, Tallahatchie, and several bayous thrown out by the Mississippi River in the northwestern part of the State. Its general direction is southwest; it is a deep, sluggish stream; the total course of nearly 300 miles, and is very irregular. It enters the Mississippi about 11 miles above Vicksburg. It is navigable all the year. The Tallahatchie River receives part of its waters from the Mississippi; so that small boats from the Mississippi can enter the Yazoo at its source and re-enter the Mississippi not far from Vicksburg.

Yazoo City, Miss., city, county-seat of Yazoo; on the Yazoo River, and on the Yazoo & Mississippi Valley (Illinois Central) Railroad; about 44 miles northwest of Jackson and 60 miles northeast of Vicksburg. It is in a fertile agricultural region in which the chief products are cotton, farm products, and lumber. The chief industrial establishments are cotton factory, lumber mill, cottonseed-oil mills, cotton gins, cotton compresses, machine shops, and brick, lumber, ice, and coal yards. The principal public buildings are the county courthouse, opera house, and library. There are five church buildings valued at \$100,000, and eight churches, for colored persons, valued at \$40,000. The educational institutions are Saint Clara's Academy (R. C.), and public schools for both races. The three banks have a combined capital of \$300,000; and the annual business amounts to \$3,500,000. The government is vested in a mayor and a council of eight members, four of

whom are elected each year. Yazoo City was settled about 1820. In 1830 it was incorporated, and in 1840 chartered as a city. In 1904 the city suffered heavily from fire; practically all the business portion was destroyed; every one of the five churches, the city-hall and Masonic Hall were also burned; the loss was estimated between \$1,000,000 and \$2,000,000. Pop. (1900) 4,944; (1910) 6,796.

J. G. McGURK,
Editor 'Yazoo City Herald.'

Yazoo City, Military Operations at and near. Yazoo City was chosen by the Confederates as a site for a navy yard, at which were constructed some formidable iron-clads. Upon Gen. Grant's approach to Vicksburg from the rear, in May 1863, the Confederates abandoned Haynes' Bluff, near the mouth of Yazoo River, upon which Lieut.-Commander John G. Walker, of the United States navy, went up the river with a small gunboat fleet to destroy all the works at Yazoo City. As the expedition approached the city, Lieut. Isaac N. Brown, of the Confederate navy, set fire to and destroyed three powerful rams which he had nearly completed, and upon which the Confederates were placing great reliance. Walker set fire to everything else of a public character, including the navy yard, containing five saw-mills, planing-mills, machine-shops, etc., and the expedition then returned. Early in June, Kimball's Union division was sent up the Yazoo to destroy the railroad bridge over the Big Black near Canton; but upon arriving at Mechanicsburg Kimball found a large Confederate force in his front at Yazoo City and Liverpool, and as the river, on which he depended for supplies, was rapidly falling, he returned to Haynes' Bluff. After the surrender of Vicksburg a report reached Gen. Grant that Gen. J. E. Johnston was fortifying Yazoo City, and that a number of steamers were at the place, employed in supplying his troops. A naval and military expedition was organized to capture or destroy the steamers and take the place. Four vessels, under Lieut.-Commander Walker, and 5,000 men under Gen. F. J. Herron, in transports, went up the Yazoo from Haynes' Bluff 12 July, and approached Yazoo City at noon next day; the Confederates were reported in force, and the iron-clad gunboat *De Kalb* was pushed ahead and opened her guns to ascertain the number and position of the enemy's guns. The Confederates had a battery of six heavy guns and the town was held by the 20th North Carolina infantry. Finding the defenses formidable, Walker dropped back and notified Herron, who at once landed his troops and a combined attack was made. After a slight skirmish on shore the Confederates fled, previously setting fire to four large steamers. Six heavy guns and one steamer fell into Union hands. Herron captured nearly 300 prisoners. While the *De Kalb* was moving slowly along and firing on the enemy, she ran on a torpedo, and sank in 15 minutes. All on board were saved. Herron destroyed all public property, captured about 2,000 bales of cotton, and returned to Vicksburg on the 21st.

On 3 Feb. 1864, in co-operation with Gen. Sherman's Meridian expedition (q.v.), a combined expedition of gunboats and transports with troops was sent up the Yazoo River from Vicksburg, with instructions for the gunboats to explore Yazoo and Sunflower rivers and all

YAZOO FRAUD—YAZOO PASS EXPEDITIONS

their tributaries. The gunboats were five in number, under command of Lieut.-Commander Owen, United States navy. Five transports conveyed the 11th Illinois and 8th Louisiana (colored) infantry and 35 colored cavalry, in all 982 men, under command of Col. James H. Coates, who was instructed to reconnoitre above Yazoo City and to obtain corn and forage on the Sunflower or on the Yazoo, and also to seize at least 1,000 bales of cotton and to destroy all flats or boats used to cross from the east to the west. From its start the expedition was annoyed by Gen. L. S. Ross, who, with a brigade of about 1,200 men, was guarding the Yazoo River and the Mississippi Central railroad, and who, on the 3d, opened fire with artillery upon one of the gunboats when near Liverpool Heights. Coates landed his men, had an indecisive fight with Ross in which he lost 6 killed, 21 wounded, and 8 missing, and at night withdrew to his transports. Next morning the expedition, under fire of Ross' artillery and musketry, passed up the river, the gunboats clearing the way to within four miles of Yazoo City, where it remained until the 6th, when two gunboats, having been ordered to reconnoitre, reported that the place was occupied in force, with five guns in position and another in course of erection. The guns opened, two shots taking effect on one of the gunboats, and the gunboats and transports fell down the river below Sattartia, where, on the morning of the 7th, Coates disembarked his entire command, drove back some Confederate skirmishers, and at night withdrew to his transports. On the 8th the expedition again pushed up the river, two gunboats passed the city and the transports landed their men within a mile of it. Next day Coates took possession of the city, and on the 11th moved up the river, arriving at Greenwood on the 14th, where he remained until the 19th, gathering cotton, corn, and forage. He then received orders to fall back to Yazoo City. On the 28th when within six miles of the place he ordered his small force of cavalry to move in rear of the city and take possession of all roads leading out of it. That afternoon he landed at Yazoo City and took position in some redoubts commanding the roads. Major Cook, with 50 colored cavalry, was sent toward Benton. When nearly six miles out Cook ran into Ross' brigade, by which he was roughly handled and pursued nearly to the city, losing 8 killed, 35 wounded, and 10 missing. Coates' pickets were much annoyed and on the morning of 5 March were driven in. Ross had been joined by Gen. R. V. Richardson's Tennessee brigade of about 600 men, and at 10 o'clock the two brigades, about 1,600 men, making a determined attack, forced portions of the Union line and gained the streets of the town. At the same time they used artillery upon the redoubt, on the Benton road beyond the town, which, with the adjacent rifle-pits, was held by a part of Coates' command and repulsed all Confederate effort to carry. At 2 P.M. Coates, with those who were not in the redoubt, made a charge through the streets and the Confederates withdrew and gave up the attempt upon the redoubt. The Union loss in the engagement was 19 killed, 80 wounded, and 18 missing. The Confederate loss was 6 killed and 51 wounded. On the evening of

the 6th Coates started on his return to Vicksburg. He took with him over 1,700 bales of cotton, and much corn and forage. The total loss of the expedition was 31 killed, 121 wounded, and 31 missing.

On 19 April 1864 a small detachment of a colored brigade, under command of Col. H. Scofield marched from Vicksburg for Yazoo City and two gunboats went up the river to co-operate in an attack on the city. Scofield skirmished sharply with a part of Gen. Wirt Adams' brigade and on the night of the 20th bivouacked 15 miles below the city. On the 22d the gunboat Petrel in attempting to run past Yazoo City, in order to fire upon the works from above, was fired upon by a section of artillery and a detachment of sharpshooters of Adams' brigade. The men were driven from the guns, the crew from the boat, and most of them captured, including Acting Master McElroy. The Confederates seized the boat, removed her eight guns, and burned her. Next morning the expedition returned to Vicksburg.

E. A. CARMAN.

Yazoo Fraud. The, a name given to the sale of lands in the western part of Georgia by a corrupt legislature, to certain large companies in 1789. This action caused great excitement and bitter controversy until settled by the United States Supreme Court in 1810. See *GEORGIA*.

Yazoo Pass and Steele's Bayou Expeditions. In the Civil War after the battle of Chickasaw Bayou, 29 Dec. 1862, and the capture of Arkansas Post, 11 Jan. 1863, Gen. Grant ordered the army to Young's Point and Millikin's Bend, where he took command in person 30 January. Work on the projected canal across the peninsula opposite Vicksburg was pushed, but on 4 February Grant questioned its success, and began to look for other routes by which the army could reach the high ground either north or south of Vicksburg. Two projects were considered. One involved cutting away from the Mississippi into Lake Providence from a point 70 miles above Vicksburg. This lake, a former bed of the river, was connected by Bayou Baxter with Bayou Macon, a navigable stream, which led to the Tensas, thence into the Washita, and finally into the Red River. Thus it was hoped the army could be transported to the lower Mississippi to co-operate with Banks against Port Hudson. It is 470 miles by the main river from Lake Providence to the mouth of Red River, and much farther by the winding bayous. Upon the cutting of the levee at Lake Providence the water from the river flowed in rapidly and the six miles of the lake beyond were soon available. But Bayou Baxter was found choked for miles with fallen trees and a thick growth of timber overhanging it. Gen. McPherson's entire corps was engaged for some time in attempting to open this channel and those below it. In March this project was abandoned.

On the east side of the river, a few miles below Helena, was Yazoo Pass. This had formed the old route of river steamers through the Coldwater to the Tallahatchie, and the Yal-labusha to Yazoo City, but it had been closed for some years by a strong levee. By reopening this route it was believed to be possible to reach the high ground on the Yazoo bluffs north of Vicksburg. This Yazoo Pass plan promised

greater success than the Lake Providence scheme. Under Lieut.-Col. Wilson of the engineers, later Maj.-Gen. James H. Wilson, the levee was cut 4 February, a way was cleared to the Coldwater, and the Pass opened to navigation on the 24th. Brig.-Gen. Ross, with 4,500 men, was ordered into the pass upon light draft transports, and, preceded by gunboats, penetrated by that stream to the Tallahatchie, and thence to the Yallahusha, where the expedition, after an advance of 225 miles, was stopped 10 March by Fort Pemberton, near the juncture of the last named streams. It was a strong work in a bend which commanded both. The fort was found to be so situated that in this time of high water neither troops nor gunboats could reduce it. As it stood only a few feet above the water, attempts were made to flood it by cutting the levee at Austin above Helena, and widening the cut into Yazoo Pass. These were unsuccessful. The expedition, after several attempts on the fort, withdrew. On the way back a reinforcement under Gen. Quimby was met, and this officer ordered a return to Fort Pemberton for further efforts. He soon became satisfied that the fort could not be reached, and ordered final withdrawal. The gunboats could not turn in the narrow channels and were forced to back out over a large part of the route. Gen. McPherson's corps had been ordered into the pass, but was delayed for lack of light draft transports, and later the intended movement of the army by that route was abandoned. Meantime the Confederates had gathered a strong land force under W. W. Loring, which became first harassing and soon after most threatening. Sherman, preceded by five gunboats of Admiral Porter's fleet, was despatched in haste through Steele's Bayou, by which route it was hoped he could reach the Yazoo, relieve Ross, then supposed to be in danger of capture, and at the same time find a practical way for the army into the Yazoo. Sherman had a winding and difficult route of 150 miles before he could reach that stream. From Steele's Bayou, which he entered at Eagle Bend, he passed to Black Bayou, and thence to Deer Creek. This opened into Rolling Fork by which he could enter the Big Sunflower, and by this stream reach the Yazoo. Even with the tremendous energy of his advance Sherman was barely in time to save the gunboats which had been attacked in Deer Creek by land forces, and were so hard pressed that Admiral Porter was considering the blowing up of his fleet and retreating with his crews through the swamps. These several attempts through the bayous east and west of the river had been carried on over hundreds of miles and against the most formidable obstacles of flooded country, dense forests, and heavily obstructed streams. They were finally abandoned, and the army reassembled at Millikin's Bend and Young's Point. From this position the army subsequently moved in the final campaign against Vicksburg.

H. V. BOYNTON.

Year, the period in which the revolution of the earth round the sun, and the accompanying changes in the order of nature, are completed. The accurate determination of the length of the year, which required great knowledge of astronomy and exact observations, could only be reached by the successive efforts of many generations. On this subject see CAL-

ENDAR. There are years of various lengths, according to the principle adopted in measuring them. The sidereal year is the interval that elapses while the sun moves from a star to the same star again (of course this motion is only apparent), a period the length of which is slightly affected by nutation (which see), but on the average is equal to 365 days, 6 hours, 9 minutes, 9.6 seconds. The tropical or civil year, sometimes called the solar year, is the time in which the sun moves from the vernal equinox to the vernal equinox again; its mean length is 365 days, 5 hours, 48 minutes, 49.7 seconds. This is the year as commonly understood. On account of the precession of the equinoxes it is rather shorter than the true period of the earth's revolution. (See PRECESSION.) A lunar year is the time required for 12 revolutions of the moon, which is 354 days, 8 hours, 48 minutes, 37 seconds. See also DAY; SIDEREAL TIME; SOLAR TIME.

Year and a Day, a period of time fixed upon by ancient statutes and common law, which must elapse between the occurrence of some event before the legal right connected therewith could be either lost or gained. A full year was intended by the expression.

Year Book, law reports of cases and decisions in England, issued annually by the scribes or clerks of the courts, from the time of Edward II. to that of Henry VIII. The name is now given to books sent out at the beginning of each year by cities, States, or countries, or by newspaper and other publishers, and which include, besides an almanac, the agricultural, political, scientific, and educational statistics and chief items of interest of the preceding year. See ALMANAC.

Yerdley, yêrd'li, or Yardley, Sir George, American colonial governor: b. England about 1580; d. 1627. After seeing service in the Netherlands he came to America in command of Sir Thomas Gates' expedition. This was wrecked at the Bermuda Islands, but he reached Virginia in 1610 and was acting governor of the Virginia colony 1616-17. Returning to England the next year he was there knighted and chosen deputy governor of the colony, filling the office 1619-21, and again from 1626 till his death. By his instructions was summoned the first legislative assembly ever gathered in America, the House of Burgesses.

Yeast is a micro-organism of the vegetable kingdom and belongs in the order of the *Gymnoasceæ* to the family of the *Saccharomycetes*, of which there are three classes, namely, *Monospora*, *Saccharomyces* and *Schizosaccharomyces*. The main characteristic of the first class, as its name indicates, is that it only develops one spore in the ascus. Thus far only one type, the *Monospora Cuspidata*, which is parasitic in *daphniada* which it destroys, has been determined. There are many representatives of the second class, while only a few of the third have up to the present time been identified. The second class,—the *Saccharomyces*—is generally what is understood under the term yeast, not only in the brewery but also in the distillery and the compressed yeast fabrication. Its structure is very simple; it consists of a single cell, which has few distinguishing characteristics. Each cell of the *saccharomycetes* is more or less globular or ovoid in form and, just

as every other vegetable cell, consists of a colorless, viscous substance (protoplasm), a cell-wall (membrane), and also a nucleus. In the protoplasm there are observed, according to the species of the plant cell, different numbers of spaces filled with cell-juice, which are termed vacuoles.

In young yeast cells the cell-wall, or membrane, is very thin—0.4 to 0.9 μ —and has almost the same refractive power as the protoplasm which it surrounds. The membrane is thickened through external influences, especially then when the yeast-cells must develop in or upon a highly nutritious medium. An increase in the thickness of the cell-wall is also accompanied by greater impermeability and a corresponding decrease in the fermentative capability of the cell. Through the action of acids or alkalis upon the yeast cell the layers of the cell-wall can be shown, which are two, and sometimes three, or even more in number. Chemically the membrane of the yeast cell consists of cellulose (erythro and achroo-cellulose), pectinic compounds, and plasmatic components, for which reason it is very nitrogenous. The cell contents consists of protoplasm with more or less glycogen. (According to Laurent there is 32.28 per cent glycogen in the dry substance.) In the young yeast cell the whole interior is filled with protoplasm, in a short while, however, apparently hollow spaces appear, which are filled with the reserve nourishment necessary for the vitality of the cells. The nucleus furnishes the substances necessary for building up the cell, and, according to its chemical composition, belongs to the albuminoids in the class of the *proteids*, and especially to the nucleins. The form of the nucleus varies considerably; in a young cell it is spheroid, flattens out with increasing age to a disk whose periphery is no longer entire, but is lobed; elliptical shapes were also found.

The nucleus is in some instances of a considerable size; its diameter in some cases being one third of that of the cell. Concerning the inner structure of the nucleus it was observed that the nucleus of the yeast cell has a pellicle as well as a nucleolus, which is spheroid, and is situated in approximately the centre of the nucleus, the space between the pellicle and the nucleolus being filled with nucleus plasma (Karyoplasma), thus having a netlike structure through which the nucleolus is suspended. One or more vacuoles were observed in several types of yeast in the Karyoplasma under certain conditions, especially then when the cells were transferred into fresh nutrient solutions. With the beginning of the propagation of the cell a corresponding development of the nucleus takes place, in either one of two ways, that is, the direct division (Amitosis), or the indirect division (Karyokinesis, Mitosis). The manner in which the nucleus divides itself differs in the various types of yeast. The yeast cell is propagated in one of two ways, either through exogen spore formation, budding, or through endogen spore formation, the real sporulation.

In the former case a new cell is detached from the parent cell, while in the latter the new cells (spores) are formed inside the parent cell, which it leaves only upon complete maturity. Several recent investigators are inclined to believe in the sexuality of yeast, and close research

with various yeasts, as *Sacch. farinosus*, *Sacch. Bailii*, etc., has been made.

Two types of yeasts have in the course of time become culture plants in the real sense of the word, through intentional continuous cultivation for certain definite purposes. These types are (1) that known as the bottom yeast in the manufacture of beer, and (2) that which is the cause of the fermentation of the top-fermented beers and of the whiskey mash. The former is so called because it settles in a thick, creamy layer upon the bottom of the fermenting vat during the slow fermentation of lager-beers in temperatures of 40° to 50° F. (4.5° to 10° C.), while the latter is termed top yeast because in the more rapid fermentation at 54° to 65° F. (12° to 18° C.) (ale, weissbeer, etc.), it is separated as a yellowish brown foam, which is forced to the surface by the escaping carbonic acid gas. It is the last named species which furnishes almost exclusively the material for the manufacture of that product known as compressed yeast.

As has been said, there are a number of independent species of yeast, which vary not only according to form and size of the cell, but also according to the composition of the nutrient medium in which they live, hence according to chemical and physical properties. Yeast flourishes luxuriantly only then when it finds not only qualitatively but also quantitatively, in the nutrient medium all the substances necessary for its nutrition. The brewer, distiller, etc., therefore endeavors to produce as vigorous a yeast as possible, in order to be enabled to conduct the fermentation in the manner best suiting his purposes. For such normal nourishment, it is essential that diverse substances are at its disposal.

Yeast thrives well when, besides water, carbon in the form of sugar, nitrogen in albuminous compounds or ammoniacal salts and various mineral components, especially sulphate of magnesia and potassium phosphate, are at its disposal. If the necessary nutriment is lacking the vitality of the yeast cell may rest, but the cell does not perish.

Various analytical data are at hand in regard to the composition of the yeast. Dumas found that the yeast contains:

	Per cent
Carbon	50.6
Hydrogen	7.3
Nitrogen	15.0
Oxygen, sulphur, and phosphorus	27.1

Mitscherlich found top yeast of the following composition:

	Per cent
Carbon	47.2
Hydrogen	6.6
Nitrogen	10.0
Sulphur	0.6
Oxygen	35.8

The differences found between bottom and top yeasts have been very slight. Wagner experimented upon top and bottom yeasts and obtained the following averages:

	Top yeast per cent	Bottom yeast per cent
Carbon	49.8	48.4
Hydrogen	6.8	6.0
Nitrogen	9.2	9.3
Sulphur + oxygen	34.2	35.8

A yeast may have all the necessary organic substances in the proper form and amount, yet

YEAST

it will not flourish if the salts are lacking. The yeast in this case is the same as any other plant organism, which must perish if it is deprived of its mineral nourishment. Hence a knowledge of the requirements of mineral substances for a yeast is of utmost importance, and many examinations were made to secure data on this point. Mitscherlich found in the ash of

	Top yeast per cent	Bottom yeast per cent
Phosphoric acid	53.9	59.9
Potash	29.8	24.3
Soda + magnesia	6.0	6.0
Calcium oxide	1.0	1.0
Silica	traces	0.0

The most essential substances which the yeast requires for its sustenance are, accordingly, phosphate of potassium and phosphate of magnesia. The above data are from elementary analyses. Naegeli later instituted investigations which should show the amount of the various combinations, which are observed in a yeast. According to his observations the yeast, when treated with water until its soluble components are absorbed, gives up to the water 37 per cent of the total weight of the dried yeast. The bodies thus brought in solution consist of compounds closely related to vegetable slime. The amount of moisture in a yeast is exceptionally large, for if it is completely dried it loses 83 per cent of its weight, so that in 100 parts of yeast only 17 parts are solid components. The mucous part of the yeast cell, the protoplasm, contains more water than the membrane which surrounds it, and consists chiefly of albuminoids, and about 2 per cent of peptone. Accordingly the composition of the yeast with 8 per cent nitrogen is:

	Per cent
Cellulose and vegetable slime	37
Common albumin	36
Easily converted glutine (casein protein)	9
Peptones (precipitable by lead acetate)	8
Fat	5
Ash	7
Extractive substances	4

According to E. C. Hansen of Copenhagen, yeast is divided into two groups, the real *Saccharomycetes*, which are capable of forming endospores, and the non-saccharomycetes, which never form spores. He subdivides the former into such which separate out sucrose and engender alcoholic fermentation, that is, which vigorously ferment saccharose, dextrose and maltose, as brewer's yeast; and such which ferment saccharose, dextrose, levulose but not maltose, as, for example, *Saccharomyces Ludwigii*; *Sacch. exiguus*, and into such which do not separate out sucrose and do not excite alcoholic fermentation, as *Saccharomyces membranaefaciens*.

The non-saccharomycetes Hansen divides into 3 groups; such which ferment solutions of dextrose and invert sugar, as *S. Rouxi*, *S. apiculatus*; such which separate out no sucrose but ferment saccharose, maltose and dextrose, as *Monilia candida*, and finally such which ferment saccharose, glycoside, galactose and lactose, the lactose yeasts. In practice the division into culture and wild yeasts would be appropriate. The yeasts can also be safely divided according to their power of attenuation, that is, the decrease in the density of the nutrient medium due to fermentation. The attenuation reached by a yeast in a diastase-free beer wort has been

agreed upon as the limit, and in accordance therewith the brewers' yeasts are graded, and we have the Froberg type with high attenuation, and the Saaz with low attenuation. Van Laer has defined a new type, Logos, so that now we have the types Saaz-Froberg, and Froberg-Logos, with all intermediate grades. The numerous wine yeasts vary according to their resistibility against heat and acids; the amounts of sugar produced by them, and the amount of fruitesters, which they impart to the liquid. The distillers' yeasts, mostly top yeasts, are known by their resistance against acids, and foreign ferments, through their fermentative capability and the amount of alcohol developed.

No one can deny that yeast induces alcoholic fermentation, but how this is accomplished is still a matter of controversy. Liebig and other chemists maintain that fermentation is called forth by a ferment contained in the yeast cell, while Pasteur deems it the necessary consequence of life without oxygen. Naegeli claims it to be a transferring of the motion of molecules of protoplasm of the yeast to the fermenting liquid. Eduard Buchner and Rudolf Rapp of Munich discovered in the yeast cell a fermentation-inciting enzyme—zymase—which, however, can only induce fermentation once after the cell is completely destroyed. This discovery, which is of much scientific import, has not yet been made applicable in practical arts.

Besides the culture yeasts, there are a number of wild yeasts, which can produce great disturbances in the liquids infected by them. In order to avoid such infection by wild yeasts and also by bacteria, Hansen experimented and succeeded in preparing a pure yeast culture, that is, a culture originating from a single cell. Such a culture is not only free from all wild yeasts and bacteria, but also can and does remain unchanged as all cells are of the same nature. A reliable fermentation process can only be obtained by the use of one single type.

Such pure cultures are variously prepared; the oldest and best known method is that of Hansen, which has recently been modified by Dr. Lindner of Berlin as the droplet-culture. Both investigators employ for the further development of the young vigorous cultures the propagation apparatus, which when once supplied with an absolute pure culture can be used for a long time if proper care is observed. Upon this pure culture method a new brewing process is based which permits of entirely sterile work from boiling the beer to the putting it on the market. This process, invented by Nathan, has been called by him in honor of Hansen, the senior in the art of pure culture, the Hansen process. Another method to obtain yeast of a high degree of purity is that in which a mixture of yeast is exposed to definite conditions of temperature, aeration, kind of nutrition, action of light, pressure and motion that one yeast of definite properties develops more and better than the other yeasts in the mixture. If, further, the corresponding layer is removed from the yeast and propagated under the aforesaid conditions, a pure yeast of a uniform character is finally obtained. This process, founded by Delbrueck of Berlin upon his scientific observations in American breweries, was further elaborated by him. An idea of the importance and value of pure yeast culture can be had from the

fact that almost all the larger breweries and distilleries employ apparatus for propagation and endeavor through observing the utmost care to protect their yeast against infection. But yeast is not only of great import to the brewer and distiller, but also to the baker, as the quality of his wares depends upon the quality of the yeast used, and in consequence thereof a special industry, that is, the manufacture of compressed yeast, has been introduced. Compressed yeast is chiefly made from distillers' yeasts; but in some instances also, beer yeasts, which must be purified and disemibittered, are utilized. The price of compressed yeast in comparison to beer yeast, is considerably high, but the baker has the advantage that by using the former his wares obtain a larger size than when the latter is used. The process of fermentation with compressed yeast develops more slowly than with beer yeast, hence the dough requires more time to ripen. Much progress has been made in the compressed yeast fabrication and diverse methods are employed in its manufacture. Many operations must be carefully and accurately observed in order to obtain a salable product. In the main these operations are: (1) Preparation of a fluid in which the yeast can properly develop, either under simultaneous formation of alcohol or without the formation of much alcohol; (2) preparation of a mass, in which there is a corresponding amount of vigorous seed-yeast, which is added to the above mentioned fluid (preparation of the mother-yeast); (3) bringing together of the nutrient medium with the stock yeast or "setting"; (4) reproduction of the yeast with or without simultaneous fermentation; (5) separation of the newly formed yeast from the fluid by skimming, etc.; (6) washing the yeast, or removing the last traces of the nutrient medium; (7) pressing of the washed and separated yeast mass; (8) forming the compressed yeast into cakes of suitable size; (9) packing of the cakes for the trade and for shipping.

For some time yeast, especially beer yeast, has been used in medicine, and has been successfully employed partly fresh and partly dried, in tablet form in cases of furunculosis, flemomen, acne, psoriasis, and other skin diseases, dyspepsia and partly in diabetes.

MAX VON KUENSBERG, PH.D.,

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Yeates, yêts, William Smith, American geologist: b. Murfreesboro, N. C., 15 Dec. 1856. Graduated from Emory and Henry College (Emory, Va.) in 1878, he was connected with the United States Fish Commission in 1879 and 1880-1, and in 1881-93 was successively assistant, acting curator, and assistant curator of the United States National Museum, in charge of the minerals and gems. He was professor of mineralogy in the Corcoran Scientific School of Columbian University (Washington, D. C.) in 1884-93, professor of geology in 1890-3. In 1893 he was appointed State geologist of Georgia.

Yeats, William Butler, Irish author: b. Dublin 13 June 1865. He obtained a secondary schooling in England and Ireland, was for three years a student of art, but turned to literature in 1886. He was a leader in the foundation of the Irish Literary Society and the National Literary Society of Dublin, and a prime mover

in the Irish Independent Theatre, thus becoming one of the chief representatives of the so-called Celtic revival. In 1903-4 he lectured in the United States on subjects connected with this movement. With E. J. Ellis he edited 'The Works of William Blake' (1893) and 'Ideas of Good and Evil' (1903). Among his various further publications in prose and verse are: 'The Wanderings of Oisín' (1889); 'John Sherman' (1891); 'The Celtic Twilight' (1893); 'A Book of Irish Verse' (1895); 'Poems' (1895); 'The Wind among the Reeds' (1899); 'The Shadowy Waters' (1900); and 'Cathleen ni Hoolihan' (1902).

Yech'ton, Barbara. See KRAUSE, LYDA.

Yedo, yě'dō. See TOKIO.

Yelisavetpol, yě-lě-ză-vět-pōly'. See ELIZ-AMETPOL.

Yellow, one of the prismatic colors; the color of that part of the solar spectrum situated between the orange and the green; a bright golden color, the type of which may be found in the field buttercup, which is a pure yellow. United with blue it yields green; with red it produces orange.

Yellow-bass, Perch, etc. See BASS. **PERCH, etc.**

Yellow Bayou, Engagement at, and Banks' Retreat from Alexandria. Gen. Banks arrived at Alexandria, La., on his retreat from Sabine Cross Roads (q.v.), 25 April 1864. Three days later Gen. Hunter handed him an order from Gen. Grant to close up the campaign against Shreveport without delay and return A. J. Smith's troops to Gen. Sherman, for operations east of the Mississippi. Hunter returned with a letter from Banks to Grant with the information that Porter's fleet was above the Alexandria Rapids in a critical situation should the army abandon it. As to the further prosecution of the Shreveport and Texas campaign, that was not to be thought of, and Banks turned his attention to getting Porter's fleet below the rapids. These falls were a mile in length, filled with rugged rocks, which at the time were nearly bare. As the vessels needed at least seven feet of water to float them, they seemed to be doomed. The plans for their release were suggested and executed by Lieut.-Col. Joseph Bailey of the Fourth Wisconsin Cavalry. The work began on 30 April, nearly the entire army at different times, being detailed for the duty; 2,000 to 3,000 lumbermen from Maine and the Northwest cut down trees; others were set to collecting stones, brick, etc., including whole houses and sugar-mills with all their machinery and kettles, and in a week a dam of timber and stone, with sunken barges in the centre, had been constructed across the river, 758 feet in width, raising the water from 5 to 6 feet deep on the rapids. The work had been prosecuted day and night, the men working up to their waists and exposed to a hot sun. The water having risen, three gunboats and another vessel ran down the rapids on the afternoon of 8 May and lay to just above the dam. Early in the morning of the 9th two of the barges broke loose, making a gap in the dam 66 feet wide, through which the water rushed in a great torrent, and the four vessels went down safely through the opening. Six gunboats and two

YELLOW BOOK OF FRANCE—YELLOW FEVER

tugs were still above the rapids, waiting for a higher rise in the water. The damage to the dam was partially repaired and wing-dams were constructed on the upper falls, which shed the water from either side into the channel between them. They were completed by the 11th, when the water had risen to 6½ feet. Meanwhile the heavier vessels had been lightened by stripping from them their armor-plates and landing some of the heavy guns, ammunition, chain cables, anchors, and provisions, and on the 12th all the vessels had run down the falls and through the dam into deeper water. Meanwhile the Confederates had gotten in Banks' front, south of Alexandria, and taken position on the river 25 miles below the town, where 1 May they captured and sunk a transport, and on the morning of the 3d captured a transport, on her way up the river with 425 men of the One Hundred and Twentieth Ohio on board. Some of the men were killed and wounded, all the officers and 270 men were captured. On the evening of the 4th another transport carrying 400 men of the Fifty-sixth Ohio, while going down the river, convoyed by the gunboats Signal and Covington, was attacked by artillery and musketry, and the gunboats went to her assistance. About 125 men on the transport were killed and wounded; she was soon disabled; the Covington, after losing more than half her men, was abandoned and burned; the Signal, also was disabled and, with the transport, surrendered. No further attempt was made to run the blockade, and for two weeks Banks' communication with the Mississippi was closed. The fleet having passed below the falls and the river rising insuring a safe passage of all the bars below, the gunboats and transports started on the morning of the 13th of May, and in the afternoon Banks marched out of Alexandria for Simsport. From the start his front, flanks and rear were harassed by cavalry and artillery, and on the 16th he had a severe engagement near Mansura, in which the Confederates were driven from position they had taken across the road to Simsport, which place his advance reached on the evening of the 17th. Here it was found that the pontoon-bridge was too short to span the Atchafalaya and Col. Bailey again improvised a crossing. The transports were ranged side by side across the river, with the planking of the pontoons laid across their bows, making a level road of about 700 yards, over which the main body of the army with its trains and artillery began passing on the 19th. While this bridge was under construction A. J. Smith's command was drawn up in line at Yellow Bayou, covering the rear of the army and the crossing of the Atchafalaya. Here Smith's troops were attacked on the afternoon of the 18th by Gen. Wharton's cavalry and Gen. Polignac's infantry. Smith's skirmishers were driven in, and at first the Confederates gained some advantage; but Gen. Mower, who was in immediate command of the Union line, made a counter-charge with two brigades of infantry and one of cavalry and the Confederate attack was repulsed. In endeavoring to follow up his success Mower was checked by a heavy artillery-fire, and withdrew to a thicket, where he formed a new line and brought up artillery. The Confederates renewed the attack and were repulsed with some loss. The thicket now took fire and

made an impassable barrier between the two sides, and Mower withdrew, leaving his dead and wounded on the field. The Union loss was 38 killed, 226 wounded, and 3 missing; the Confederate loss, 452 killed, wounded and missing, of whom 180 were taken prisoners. The army had all crossed the Atchafalaya on the 20th. Banks yielded the command to Gen. Canby, who had been ordered to relieve him; the navy and transports passed into the Mississippi; and the Red River campaign, one of the most humiliating of the war, had ended. On the return march from Alexandria the Union loss was about 165 killed, 650 wounded, and 450 captured or missing. Gen. Taylor says the Confederate loss in the entire campaign, from Sabine Cross Roads to Yellow Bayou, was 3,976. Consult: 'Official Records,' Vol. XXXIV.; Taylor, 'Destruction and Reconstruction'; Mahan, 'The Gulf and Inland Waters'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Yellow Book of France, a government publication issued regularly since 1861, designed to furnish historians and others with official information. It is similar to the British Blue Book and the German White Book.

Yellow Boy, a popular name for a gold coin, formerly much used in the Far West. The term originated in Great Britain, the name being applied to the gold sovereign.

Yellow Copperas, a name sometimes used for the mineral copiapite. Crystallization, monoclinic, usually in translucent pearly yellow plates; hardness, 2.5; composition, a basic sulphate of iron; specific gravity, 2.1. Found near Copiapo as an incrustation on coquimbite; also in other places in South and North America.

Yellow Earth, a clay or kaolin strongly impregnated with hydroxide of iron or limonite. Its chief use is for pigment.

Yellow-eyed Grass, the common name of the genus *Xyris*, composed of rush-like plants, with bright yellow flowers produced from the summit of a naked scape, conspicuous in sandy bogs in July and August. They are mostly of tropical distribution about the world. The yellow-eyed grass (*X. bulbosa*) has a bulbous root; equitant, linear, twisted leaves; an erect, 2-edged, twisted scape; roundish, acute heads, supporting a number of small yellow flowers projecting from between the scales, with perianth and other parts of the flowers in threes. Another species with pretty, large petals (*X. caroliniana*), occurs near the sea from Rhode Island southward. The *X. umbriata*, a plant two feet high, the divisions of its calyx conspicuously fringed on the wing-margined keel, and plumose at the summit, is found in the pine barrens of New Jersey and southward. The foliage and roots of *X. indica*, of *X. americana*, and of *X. vaginata*, are used for a remedy for leprosy and the itch, in India, Guiana and Brazil.

Yellow Fever is an acute infectious disease which is transmitted from the sick to susceptible individuals through the agency of mosquitoes. The yellow fever mosquito (*Stegomyia fasciata*) is found in tropical and semi-tropical regions, and especially in lowlands near the sea or in river valleys. This mosquito serves as "an intermediate host" for

YELLOW FEVER

the yellow-fever parasite, which is present in the blood of those sick with the disease during the first three days of the attack. After filling itself with blood from a yellow-fever patient a period of 12 days is required for the development of the parasite in the body of the mosquito before it can transmit the disease, by its sting, to another individual.

These facts have been established by the experiments of a board appointed upon the recommendation of the present writer, in 1900, for the study of yellow fever in the island of Cuba. The late Maj. Walter Reed, surgeon, U. S. A., was president of this board, and the success attained is largely due to his carefully made plans and their intelligent and conscientious execution by himself and his associates.

In a "preliminary note" read at the meeting of the American Public Health Association, 22 Oct. 1900, the board gave a report of three cases of yellow fever which they believed to be the direct result of "mosquito inoculations." Two of these were members of the board, namely, Dr. Jesse W. Lazear, and Dr. James Carroll, who voluntarily submitted themselves to the experiment. Dr. Carroll suffered a severe attack of the disease and recovered, but Dr. Lazear fell a victim to the disease and to his enthusiasm in the cause of science and humanity. Fortunately no other deaths occurred during the subsequent experiments which Maj. Reed found it necessary to make in order to establish the fact that yellow fever is, beyond question, transmitted by mosquitoes of the genus *Stegomyia*, and in no other way. In a report made in May 1901, Maj. Reed says: "We have thus far succeeded in conveying yellow fever to twelve individuals by means of the bites of contaminated mosquitoes." These experiments were made upon individuals who volunteered to submit themselves to the mosquito inoculations with a full knowledge of the possibility of serious and even fatal results. Some of the volunteers were U. S. soldiers, and some were Spanish immigrants who had recently arrived in Cuba. Further experiments showed that blood drawn from a yellow-fever patient during the first three days of the disease and injected by means of a hypodermic syringe beneath the skin of a susceptible individual gives rise to a characteristic attack of yellow fever in the inoculated individual. But all attempts to demonstrate the specific infectious agent (yellow-fever parasite) in the blood or in the bodies of infected mosquitoes have been unsuccessful. This is probably due to the fact that the yellow-fever parasite is so small as to be practically ultra-microscopic. This inference is supported by experiments made in Cuba by Assistant Surgeon James Carroll, U. S. A., a member of the board heretofore referred to. Dr. Carroll found that when blood taken from the circulation of a yellow-fever patient was passed through a Berkefeldt filter a small quantity of the filtrate injected under the skin of a susceptible person gave rise to a typical attack of the disease.

The experimental results obtained by Maj. Reed and his associates have been fully confirmed by several independent investigators, including a board of experts from the Pasteur Institute of Paris, who were sent to Brazil to make researches with reference to the etiology of this disease.

Having ascertained that yellow fever is transmitted from man to man by an intermediate host—mosquitoes of the genus *Stegomyia*, Maj. Reed and his associates conducted a series of well-planned experiments for the purpose of ascertaining whether the disease may also be propagated, as has been commonly supposed, by clothing, bedding and other articles which have been in use by those sick with the disease. The results of these experiments were entirely negative. That is, all efforts to communicate the disease to susceptible individuals through the medium of such articles were without result.

In view of what has thus far been said it is evident that the preventive measures which were formerly relied upon to arrest the epidemic extension of this infectious disease were either of no avail or of comparatively little value. Isolation of the sick from contact with non-immune individuals is not necessary, but protection of the sick, by mosquito-bars, from the bites of mosquitoes is all-important. Disinfection of clothing and bedding is of no avail, but the destruction of infected mosquitoes, by sulphur fumigation or otherwise, is an essential measure of prophylaxis. Street cleaning and municipal sanitation generally have no material effect in preventing the extension of this disease, except in so far as they result in destroying the larvæ and breeding places of mosquitoes. Applying the knowledge gained by Maj. Reed and his associates in a practical way, as above indicated, the medical officers of the U. S. army stationed in Cuba have been able to completely eradicate yellow fever from the city of Havana, which had been the principal endemic focus of the disease for many years; and sanitarians feel confident that by the application of the same methods the epidemic extension of the disease within the limits of the United States, or elsewhere, may be entirely prevented. Thus has yellow fever, which formerly ranked with cholera and bubonic plague,—although having a more restricted area of prevalence,—as one of the most fatal scourges of the human race, been robbed of its power for mischief by the painstaking researches of scientific investigators. The limits of the present article only permit a brief reference to the history of the disease under consideration. It has a comparatively restricted geographic range, but there is every reason to believe that this might be greatly extended if cases of the disease should be introduced to all of the regions where the intermediate host (*Stegomyia fasciata*) of the "yellow-fever germ" is found. That the disease has not been introduced into regions remote from its principal endemic foci is probably due to the comparatively brief duration of the attack, to the fact that the infectious agent is only present in the blood during a brief period (three days) and to the circumstance that it cannot be transmitted in any other way than by inoculation—either directly, as in the experiments of Reed and his associates, or through the medium of an infected mosquito. Epidemics have occurred in the United States at all of our principal sea-ports on the Gulf of Mexico and on the Atlantic coast as far north as Boston. It has also invaded many of the Southern States, prevailing as a widespread epidemic in the interior, and has extended up the valley of the Mississippi as far as

YELLOW FEVER

St. Louis. It has been epidemic at all the principal sea-port cities of the West Indies, of Mexico, of Central America and of South American countries bordering upon the Gulf of Mexico, also upon the Pacific coast of Mexico and South America and in the Atlantic-coast cities of Brazil and the Argentine Republic. The cities of Havana, Vera Cruz and Rio de Janeiro have long been regarded as its principal endemic foci. The climate of these cities is favorable to the survival of the *Stegomyia* throughout the year. Consequently, when once introduced, the disease continued to be propagated through a series of cases, occurring successively without regard to seasons. Thus it was ascertained by the Yellow Fever Commission, of which the writer was a member (1879), that during the ten years from 1870-79 there was not a single month without some recorded deaths from yellow fever, and this continued to be the case until the disease was eradicated in 1901 by the well-directed efforts of Col Gorgas, of the medical department, U. S. A. In his report as sanitary officer of the city of Havana for the month of November 1901, he says: "Last year (1900) we had, during this month, 214 cases and 54 deaths. This year the last case of yellow fever occurred on 28 September; that is, we have gone over two months without a single case or death belonging to Havana." . . . "This result I consider due to the system, introduced last February, of killing infected mosquitoes in the neighborhood of each point of infection as it developed." The introduction of yellow fever into the previously healthy city of Havana is recorded by the historian Pezuela, as follows: "Although Havana is situated on the northern boundary of the torrid zone, it was very justly considered one of the most healthy localities on the island before its invasion, in a permanent manner, by the *vomito negro*, imported from Vera Cruz in the summer of 1761. In May there came from Vera Cruz, with materials and some prisoners destined for the works on the exterior fortifications of Havana, the men-of-war *Reina* and *América*, which communicated to the neighborhood the epidemic known by the name of *vomito negro*. At the end of the following June there were stationed in this fort nine men-of-war, despatched from Cadiz, and sent to the chief of squadron, Don Estienne de Hevia; they brought a reinforcement of 2,000 men. More than 3,000 persons succumbed to the epidemic on this, the first appearance of the *vomito*."

History also records the first introduction of the disease to the city of Rio de Janeiro. The highest medical authorities in Brazil agree that yellow fever was not endemic in the principal seaports of the empire prior to the year 1849, when it was introduced to the city of Bahia by the North American brig *Brazil*, which sailed from New Orleans, where yellow fever was prevailing, and touched at Havana. Two of the crew of this brig died of yellow fever during her voyage from the latter port to Bahia. Soon after her arrival the disease made its appearance among those who had communicated with the ship. The first case occurred a few days after the arrival of this brig (3 November). From Bahia the disease was carried to Rio Janeiro, where during the epidemic season of 1890 it caused a mortality of 4,160.

In regions where the winter temperature is so low as to kill mosquitoes, or render them inactive, epidemics of yellow fever terminate upon the occurrence of frost, or of continued cool weather. Under such circumstances the disease is not apt to recur during the succeeding warm season, except as a result of a fresh importation of a yellow-fever case, from which mosquitoes of the new brood may become infected. Thus in the United States, even as far south as the city of New Orleans, a recurrence of the disease after its epidemic prevalence is probably rarely, if ever, due to the survival of infected mosquitoes from the year before. It has been shown, however, by Maj. Reed, and by others that infected mosquitoes may survive in a warm room for more than two months. Prior to the civil war yellow fever prevailed almost annually in New Orleans and was generally believed by the residents of that city to be "a disease of the climate" beyond the control of any preventive measures. Later, under a more stringent administration of quarantine restrictions, such success was attained by the health authorities in preventing the introduction of cases of the disease, and consequently of epidemics, that a complete change occurred in public sentiment and it is now generally recognized that the introduction of one or more cases from some foreign seaport—usually Havana or Vera Cruz—is an essential prerequisite for the development of an epidemic in the city of New Orleans. The years of greatest mortality in this city have been: 1847, 2,259; 1853, 7,970; 1854, 2,423; 1855, 2,670; 1858, 3,889; 1867, 3,093; 1878, 4,600.

In 1793 the city of Philadelphia, then a town of about 40,000 inhabitants, suffered a devastating epidemic, the mortality being about 4,000, or 10 per cent of the population. This city was again visited by the scourge in 1797, but the disease was less extended and less fatal—total mortality, 1,300. Philadelphia again suffered in 1798, the mortality being 3,645. The disease also prevailed during this year in more northern seaport cities, although the mortality was comparatively small except in New York, where the deaths numbered 2,080—Boston 200, Portsmouth 100, New London 81. The disease again prevailed in Boston, Philadelphia, Baltimore, Wilmington, and Charleston, in the year 1800. Minor epidemics continued to occur almost annually in one or more of our southern seaport cities until the year 1853, when a fatal and widespread epidemic occurred, involving considerable areas in the States of Florida, Alabama, Louisiana, Mississippi, Arkansas and Texas. The epidemic of 1867 was also notable in the annals of this disease, although the area of prevalence was not so great as in the epidemic of 1853. The disease prevailed extensively in the State of Texas, causing a mortality of 1,150 in the city of Galveston alone. In Louisiana the city of New Orleans suffered the heaviest loss (3,093). The next great epidemic within the limits of the United States occurred in 1873. The States of Florida, Alabama, Mississippi, Louisiana and Texas were invaded. The mortality in the city of New Orleans (225) was comparatively small, but Shreveport lost 759 of its inhabitants, and the disease extended its ravages to Memphis, Tenn., where there was a mortality of about 4,000.

The last great epidemic of yellow fever in

YELLOW FEVER

the United States occurred in 1878, when 132 towns were invaded in the States of Louisiana, Tennessee, Alabama, Mississippi, and Kentucky. The total reported mortality was 15,034, and the number of cases more than 74,000. Yellow fever has never invaded the populous countries of Asia, which have their own endemic pestilential maladies. It has been introduced from the West Indies to Spain and to Portugal, but is unknown as an epidemic in other countries of Europe. In Africa, it appears to be endemic on the west coast and some authors believe that this was the original home of the disease. Others contend that it was originally a disease of the West Indies and that its occurrence on the African coast resulted from the importation of cases from those islands. The early historians, Herrera, Oviédo, Rochefort, and others, make reference to epidemics among the natives which occurred prior to the discovery of the Antilles, and to fatal pestilential diseases among the first settlers of these islands; but their accounts are not sufficiently exact to enable us to affirm that the disease referred to by them was yellow fever. The west coast of Africa was discovered and colonized to some extent before the discovery of America, but the first authentic accounts of the prevalence of yellow fever on this coast date back only to the year 1778, over two centuries after the first settlements had been established. On the other hand, this very epidemic of 1778 at St. Louis (Senegal), was traced to importation from Sierra Leone, a portion of the African coast which, according to Hirsch, "appears to be the headquarters of the disease, and the starting-point of its epidemic inroad into the territories lying to the north and south, as well as into the West African islands."

Rochefort, whose 'Histoire naturelle et morale des isles Antilles de l'Amérique' was published in Holland in 1558, says of the West Indies: "The air of all those islands is very temperate, and healthy when one is accustomed to it. The *peste* was formerly unknown there as well as in China and other places in the Orient; but some years since the islands were afflicted with malignant fevers, which the physicians considered contagious. The bad air was brought there by some ships which came from the coast of Africa, but at present we hear nothing more of these maladies."

It seems very probable that a pestilential malady which prevailed for a time in these usually healthy islands and then disappeared, was in fact yellow fever, and that it was introduced by ships from the west coast of Africa is not at all incredible. Indeed, it almost seems necessary to look for an original endemic focus of the disease outside of the West Indies, for the reason that, in the comparatively few places where it is now endemic, there is historical evidence to show that there was a first importation and a previous period of exemption; while, on the other hand, the conditions upon which endemicity at the present day seem mainly to depend, were formerly unknown—conditions arising from the aggregation of population at seaport cities, as at Havana, Vera Cruz, and Rio Janeiro.

In 1879 the writer went to Havana, as a member of a commission appointed by the National Board of Health, for the investigation of questions relating to the etiology of yellow fever.

One of the main objects in view in the appointment of this commission was the discovery, if possible, of the specific cause of the disease. The commission was fully equipped with the best microscopical apparatus, and with whatever else seemed necessary to promote the accomplishment of the object in view.

As a result of investigations made at that time and subsequently at Rio de Janeiro in 1887 and in Havana in 1888 and 1889, I formulated the following conclusions in my final report:

"The specific cause of yellow fever has not yet been demonstrated.

"It is demonstrated that micro-organisms capable of development in the culture-media usually employed by bacteriologists, are only found in the blood and tissues of yellow fever cadavers in exceptional cases, when cultures are made very soon after death."

Subsequent researches by other investigators have not invalidated these conclusions. For while the researches of Reed and his associates have demonstrated the fact that the specific infectious agent ("germ") of the disease is present in the blood, they have failed, as heretofore stated, to isolate or to recognize this specific infectious agent, and no one else, up to the present time, has been more fortunate. Numerous claims have, however, been made to the discovery of the yellow fever germ.

My visit to Rio de Janeiro in 1887 was made with the special object of investigating the claim of Dr. Domingos Freire, of that city, who had published an elaborate work giving an account of his *Cryptococcus santhogenicus*, and of his extensive inoculation experiments, made with a view to producing an immunity to the disease. In an address delivered in Paris in 1887, Freire gives the following account of his *cryptococcus*, which he claimed to obtain in cultures from the blood of yellow fever patients. He says:

"Each adult cell is ruptured at one or several points, and allows to escape its contents, composed of germs which are to perpetuate the species, and two pigments—one yellow, destined to infiltrate the tissues, and to produce the icteric color which has given name to the malady; the other black, insoluble, and destined to be carried along the circulatory current, producing either capillary obstructions or blood stasis in the parenchyma of the organs."

This account is entirely fanciful, and is evidently based upon erroneous observation and misinterpretation of what had been seen under the microscope, and to imperfect methods of research. No such micro-organism as Dr. Freire has described is known to bacteriologists, and certainly nothing of the kind is to be found in the blood and tissues of yellow fever cases, as Dr. Freire asserts.

With reference to Dr. Freire's protective inoculations, which he had practised, under government patronage, on a large scale, I say in my report to the President of the United States (1888): "There is no satisfactory evidence that the method of inoculation practised by Dr. Domingos Freire has any prophylactic value." Although Dr. Freire stoutly contested the truth of my conclusions, the scientific world has long since ceased to attach any importance to his claims.

A more recent claim to the discovery of the yellow fever germ is that made by Sanarelli, an

YELLOW-HAMMER

Italian bacteriologist, who visited Brazil for the purpose of making investigations with reference to the etiology of this disease. Sanarelli obtained from the blood of a certain proportion of the cases which came under his observation (post mortem) a bacillus which he believed to be the cause of the disease. His standing as a bacteriologist and his published papers relating the details of his experiments led to a general acceptance of his claims by members of the medical profession in Brazil and to some extent in other countries. But the researches of Maj. Reed and his associates have shown that the *Bacillus icteroides* of Sanarelli is a common and widely distributed species which has nothing to do with the etiology of yellow fever, although it may occasionally be obtained in cultures from yellow fever cadavers. It was not present in any instance in the blood obtained from patients in the early stage of the disease, when this blood was proved by experimental inoculations to be capable of reproducing the disease in non-immune individuals, nor could it be obtained from the bodies of infected mosquitoes which has been proved to be capable of communicating the disease.

Yellow fever is a disease in which immunity results from suffering one attack, and this immunity usually lasts for many years, or for life. Second attacks may, however, occur, although this is rare.

The mortality from the disease differs greatly in different epidemics and among different classes and races. It has been asserted that the negro race has a congenital immunity from yellow fever, but this is a mistake. The susceptibility of the negro is, however, much less than that of the white race, and among those attacked the mortality, as a rule, is small. This is shown by the statistics relating to white and black troops in the British service at West India stations. "While in Jamaica the annual loss among the former amounts to 102 per 1,000 of the mean strength, the deaths among the blacks did not exceed 8 per 1,000. In the Bahamas the mortality of the whites was 59 in 1,000, that of the blacks 5.6 in 1,000" (La Roche).

In the report of the Board of Experts appointed by Congress to investigate the epidemic of 1878, we find the following remarks: "Berwick City, 40 cases among colored, no deaths." "Morgan City, 21 deaths among colored persons." "Brownsville (Tenn.), of 162 colored cases, 21 died." "Chattanooga, of 685 cases, 256 whites, 429 colored; of 164 deaths, 118 whites, 46 colored." "Decatur (Ala.), of 64 white cases, 26 died; of 168 colored, 21 died."

Barton gives the following figures, showing the mortality per 1,000 among different races, and those of the same race from different latitudes, in the city of New Orleans in the great epidemic of 1853.

	Per 1,000
Native Creoles.....	3.38
Strangers from West Indies, Mexico, and South America.....	6.14
Strangers from Southern States of the Union...	13.21
Strangers from Spain and Italy.....	22.06
Strangers from Middle States of the Union....	30.69
Strangers from New York and New England States.....	32.83
Strangers from Western States of the Union...	44.23
Strangers from France.....	44.13
Strangers from British America.....	50.24
Strangers from Great Britain.....	54.19
Strangers from Germany.....	125.01
Strangers from Scandinavia.....	163.26

Strangers from Austria and Switzerland.....	200.06
Strangers from Netherlands.....	258.94

There is probably no difference in the susceptibility of the sexes, but males are attacked in greater proportion than females, because they more frequently, and often recklessly, visit infected localities. The mortality is, as a rule, considerably greater among males. Ligon, in giving an account of the pestilence at Barbados in 1647, of which he was an eye-witness, says: "The cause was unknown; one could not say if the ships of commerce had imported the scourge, or if it came from bad food, marshy water, the intemperance of the colonists, and, above all, the great quantity of *sau-de-vie* which they drank. . . . It was the most debauched who perished first, and not one woman died for ten men." No doubt Ligon was right in ascribing the difference in the mortality of the sexes largely to the difference in their habits, with reference to the use of *sau-de-vie*. Those who habitually use spirituous liquors are less likely to recover from an attack than the temperate, and a recent debauch is a recognized predisposing cause.

The mortality among children is considerably less than among adults. This applies especially to children from 5 to 15 years of age. The mortality among children under 5 is somewhat greater.

The idea which formerly prevailed in New Orleans and Havana that native born citizens — "creoles" — have an inherited immunity from the disease is not well founded. Whatever immunity they may enjoy is no doubt, to a great extent at least, due to an attack of the disease frequently occurring during childhood and usually unrecognized.

Hinemann writes with reference to Vera Cruz: "Until lately the physicians and people of Vera Cruz supported with fanaticism the dogma that natives were absolutely exempt from yellow fever. But the fearful epidemics of recent years (1875, 1877, 1878) have worked a change; for so many native children and adults suffered, that the truth could no longer be denied that these do not enjoy an absolute immunity."

In Cuba, the dogma that creoles are exempt from yellow fever, did not withstand the searching investigation made by the Havana Yellow Fever Commission of 1879.

Nevertheless the mortality from this disease among the creole population of cities where it has established itself as an endemic malady is comparatively small, and by far the largest quota of its victims is drawn from among the strangers who visit the infected places, or residents who have recently located in them.

Geo. M. STERNBERG,
Surgeon-General U. S. A.

Yellow-hammer, originally, in Great Britain, the common yellow bunting (*Emberiza citrinella*), which is yellow above, varied by dark-brown patches, the under parts being pure yellow, and the wing-feathers dusky black, with brown or yellow edges. The flanks are of a brownish hue. The nest is placed on the ground, and is composed of grasses, moss, roots, etc., and lined with hair. These birds, when fat, in the autumn, are much in request for their flesh. These inoffensive birds are regarded with superstitious dislike in some dis-

YELLOW JACK — YELLOW PINE INDUSTRY

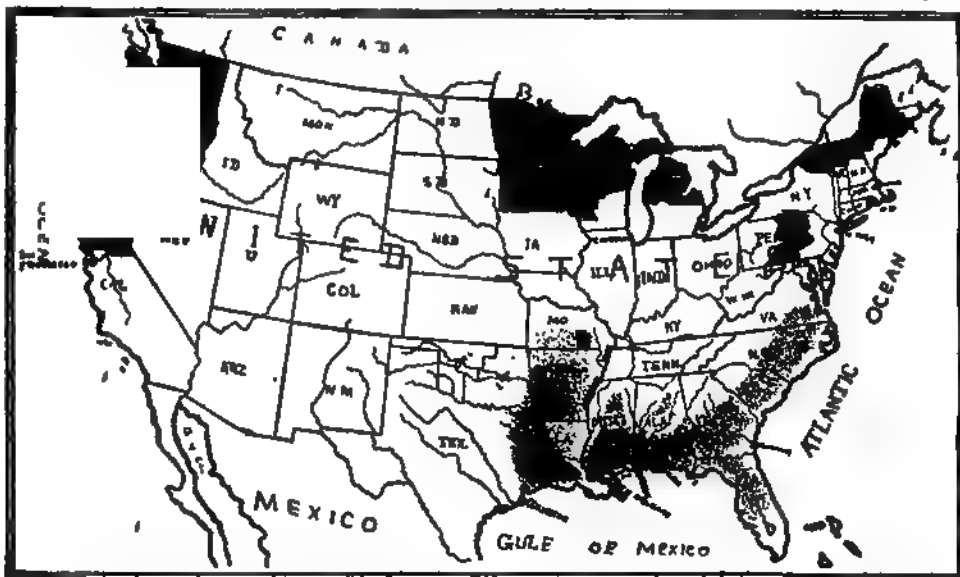
tricts, and their eggs are broken by boys whenever they are discovered, a foolish saying being current that each egg contains a drop of "devil's blood." In the United States the term is misapplied to the goldenwinged woodpecker or highhole. See FLICKER.

Yellow Jack, a quarantine flag displayed at naval hospitals and from vessels in times of epidemics (see QUARANTINE). Also a common name for yellow fever.

Yellow-jacket, any species of small American wasp, marked with black and yellow stripes. See WASP.

Yellow Pine Industry, The. No branch of American lumbering is of such importance as the yellow pine industry of the southern States. The States in the yellow pine district include Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas, Arkansas, and Missouri. In

small portable mill, which cuts yearly 100,000 feet, to the colossal modern forest-destroyer, employing hundreds of men, requiring miles of log road, and producing 50,000,000 feet per annum. Of these 10,000 sawmills, only 231 were reported in 1900 to have a capacity of 10,000,000 feet and upward. North Carolina has the greatest number of small mills,—over 1,800,—while Louisiana has the greatest number of large modern plants. The government reports for 1900 show that there were 149,908 laborers in the lumber industry of the States in which lies the yellow-pine belt. These men draw yearly a combined wage of \$35,000,000, and help to put forth a product which finds its way into almost every part of the civilized world. The seaports figuring conspicuously in the exporting of yellow pine are: Brunswick, Ga.; Pensacola, Fla.; Mobile, Ala.; Gulfport, Miss.; Pascagoula, Miss.; Sabine Pass, Texas; and New Orleans, La. Pensacola is the largest exporter,



A Map from the "Review of Reviews" showing the Location of the Four Great Lumber-Producing Districts in the United States, with the General Distribution of Yellow-Pine Timber in the South. (Approximately speaking, the stand of yellow pine per acre is about as follows: Florida, 2,500 feet; Alabama, 5,000 feet; Arkansas, 5,000 feet; Mississippi, 8,000 feet; Louisiana, 8,500 feet; Missouri, 4,000 feet; Texas, 8,000 feet; No. Carolina, 4,000 feet; So. Carolina, 4,000 feet; Georgia, 4,000 feet; and Virginia, 3,500 feet.)

this section are situated 43 per cent of the sawmills of the country. The amount of standing yellow-pine timber in the South was estimated by the government, in 1903, to be 177,000,000,000 superficial feet. The distribution of this timber is approximately as follows:

STATE	Number of acres	Number of superficial feet
Alabama	2,250,000	11,250,000,000
Arkansas	2,000,000	9,000,000,000
Florida	5,000,000	12,500,000,000
North Carolina, South Carolina, Virginia, and Geo. ga.	7,000,000	28,000,000,000
Mississippi	5,000,000	40,000,000,000
Louisiana	4,500,000	38,250,000,000
Texas	4,500,000	36,000,000,000
Missouri	1,500,000	2,000,000,000

There are almost 10,000 saw-mills in the yellow-pine belt of the South, varying from the

with Mobile a close second. The importance of these last two ports may be realized by a glance at the following figures:

	1902	1903
Total export of yellow pine	906,742,088 superficial feet	
Export of yellow-pine lumber and timber from Pensacola	263,304,036 superficial feet	337,415,577 superficial feet
Export of yellow-pine lumber and timber from Mobile	236,985,472 superficial feet	238,660,451 superficial feet
Total export of lumber and timber from the United States	1,458,110,268 superficial feet	

There are three distinct markets for southern yellow pine,—the local, the foreign, and the domestic. The local market consumes about 15 per cent of the output, the foreign 10 per cent, and the domestic 75 per cent. Hence, it is seen that into the interior and eastern States

YELLOW PUCCOON—YELLOWLEGS

goes the bulk of southern yellow pine. The lumber in this last-named trade is generally kiln-dried and dressed, while to foreign countries are sent rough lumber and great quantities of square timber. See also **PINK**.

Yellow Puccoon. See **PUCCOON**; **GOLDEN SEAL**.

Yellow-rattle, a scrophulariaceous plant, *Rhianthus crista galli*, an annual herb with opposite, lanceolate, sessile leaves, and terminal, one-sided, leafy-bracted spikes of yellow flowers. The corollas are two-lipped, with an arched upper lip, and three-lobed lower one. The capsule is orbicular and flat, with several round-winged seeds, which rattle about the pod when shaken, and have given rise to other descriptive names, such as rattle, rattle-box, penny-rattle, etc. In European fields it is very abundant and becomes a pest, since it is parasitic and attaches itself by suckers to the roots of living grasses.

Yellow Ribbon, Order of the. See **ORDERS, ROYAL**.

Yellow River. See **HWANG** or **HOANG-HO**.

Yellow-root, either one of two ranunculaceous plants, one being known as the shrub yellow-root (*Xanthorrhiza apifolia*). Its long roots and rootstock, leaves, bark and pith, are bright yellow, and the root is extremely bitter and astringent, and is used as a tonic. This yellow-root grows in the southern United States and has pinnate leaves clustered at the top of a short stem, giving the plant a fern-like aspect. The foliage turns to gorgeous lines of scarlet and orange in the autumn. The five-merous flowers are wine-colored. The other yellow-root (*Hydrastis canadensis*) is known also as golden-seal, or yellow puccoon; its root is a tonic drug. The plant has abundant reniform, palmately-lobed, basal leaves, and two cauline ones, the uppermost of these subtending the solitary, greenish-white flower. The puccoon (q.v.) is found in woods in the eastern United States and furnished the Indians with a favorite yellow dye.

Yellow Sea, or Hwang-hai, hwang-hi, a gulf of the Pacific Ocean, extending between the northeast coast of China, and the western coast of Korea, northward to Manchuria; length about 600 miles; greatest breadth about 400 miles. North and northwest it terminates in the gulfs of Liao-tung and Pe-chi-li, the latter of which receives the waters of numerous large and important rivers. On the east coast are numerous groups of islets, part of them included in the Korean Archipelago. The Yellow Sea is very shallow, and is so named from the muddy lemon-yellow color of its waters near the land, caused by the large quantity of alluvium continually brought into it by the Hwang-ho or Yellow River, and the Yang-tse-Kiang, which gradually tends to decrease its depth.

Yellow-weed. See **DYER'S ROCKET**.

Yellow-wood, a name applied to several timber trees and shrubs, including *Cladrastia lutea*. This is an uncommon leguminous tree, known in cultivation as the virgilia, American or Kentucky yellow-wood, and is indigenous to the United States from Kentucky southwards. The yellow-wood attains to a height of 60 feet, with a trunk some two feet in diameter. It usu-

ally divides into two or three limbs not far from the ground, which ramify into slender and somewhat drooping branches, forming a broad, graceful head. In winter the smooth, silvery-gray bark of its main trunk, and red-brown of its delicate sprays, are very interesting. The limbs, however, are brittle and break easily. The foliage of the yellow-wood consists of light-colored, odd-pinnate leaves, turning to clear yellow in autumn; and fragrant panicles a foot or more long, of flowers, pea-like and milk-white, droop from the ends of the branches. The fruits are linear legumes. A yellow dye was made from the hard golden-tinted wood, which is used for fuel and occasionally for gun-stocks. The yellow-root (q.v.) (*Xanthorrhiza*); the Osage orange (*Maclura aurantiaca*), a favorite hedge plant; fustic, a dyestuff yielded by the wood of *Maclura tinctoria*, a West Indian tree with oblong, taper-pointed leaves and an edible fruit; and *Schaefferia frutescens*, the valuable boxwood of the West Indies, are all known as yellow-woods. Australian yellow-woods are the *Acronychia laevis*, *Hovea longipes*, and *Xanthostemon pachysperma*; and the white teak, or Queensland yellow-wood (*Phindesia oxleyana*), also called light yellow-wood, is a tall, slender tree with many branches. Another tree called light yellow-wood is the *Rhus rhodanthema*, bearing large red flowers, and growing to 80 feet in height. It is native to Queensland, and yields a fine cabinet-wood, close-grained, capable of taking a fine polish, sound and durable. Natal yellow-wood is a tree of about the same height (*Podocarpus elongata*), with a close-grained wood which will not bear exposure out of doors, but is extensively used for furniture and interior house-building. The bastard yellow-wood of the same region is *P. pruinosa*, with a tough durable wood, also used in house building; still another species (*P. latifolia*), an evergreen about 80 feet high, and having an aromatic wood, is the East Indian yellow-wood. This same name is given to the satin-wood (*Chloroxylon swietenia*). The prickly yellow-wood is *Xanthoxylum caribaeum* (q.v.).

Yellowbird, any of several familiar birds prevailing yellow in plumage. In the United States the name belongs to two small garden-visitors. One is the goldfinch (q.v.), and the other, often distinguished as "summer" yellowbird, is a warbler (*Dendroica aestiva*), common in summer throughout all the eastern United States and Canada. It is greenish yellow, brightest on the breast, where it is diversified by salmon-colored streaks. The song is a melodious trill, often heard among the roses and lilacs of the garden, where the bird is likely to fix its deep nest of hempen shreds in an upright fork. The eggs are pink, with reddish and purplish dots. This nest is one of the receptacles most often chosen by the cow-bird for its surreptitious egg; but the yellowbird frequently defeats the intruder's object, by building a new nest on top of the first one, burying the strange egg.

Yellowhead, a yellow-headed blackbird. See **BLACKBIRD**.

Yellowlegs, a genus (*Totanus*) of birds of the family *Scolopacidae*, large snipe-like species with cross-barred tail-feathers, well-marked gape, long, slender non-sensitive bill and green-

YELLOWPLUSH PAPERS—YELLOWSTONE NATIONAL PARK

fish yellow legs, from which they take their common names of yellowlegs, green-shanks, etc., while, because of their constant noisy calling, they are known to gunners as tattlers or tell-tale snipe. The greater yellowlegs (*T. melanoleucus*) inhabits during some part of the year nearly the entire American continent and breeds chiefly north of the United States, in which it is well known as a coastwise migrant. It is 13 to 14 inches long, with a spread of wings of two feet. Above the color is a mixed dark ashy, varying with the age and season, below white streaked and barred with ashy black. Although chiefly a maritime bird, this species also migrates through the Mississippi Valley and is found about the lakes of the interior; and even along the coast it is fond of frequenting the fresh and brackish pools on the meadows, where it finds an abundance of food in the small fishes, mollusks, shrimps and crabs. It also eats worms, insects and the spawn of fishes, which it catches with great facility. During the migrations, which occur in April and from late August to October through the greater part of the United States, it is commonly seen in small parties of 6 or 8, often consorting with other species of tattlers, willets and godwits. The flight is swift and often elevated, and in alighting in pools in which they wade leg-deep they keep the wings raised until well settled. They are extremely alert and noisy and thus provoke the indignation of gunners. The nest is a grass-lined depression on the ground and the four, pyriform, greenish yellow, brown and gray blotched eggs measure upward of two inches in length. The lesser yellowlegs (*T. navipes*) is in form and colors nearly an exact miniature of the last, but is only 10 or 11 inches long, with a spread of 20 inches. Its range and habits are similar to those of the larger species, but it is much commoner in the East and flies in much larger flocks. It is much better known to shooters of shore-birds. The eggs are more variable, the ground-color being clay or buff, and the markings usually very bold and distinct. The European green-shank (q.v.) occasionally straggles to our shores and may be distinguished from *T. melanoleucus*, which it resembles in size, by the distinctly green color of the lower legs and feet. About a dozen related species are found in other parts of the world and the genus *Heterodromas*, containing our solitary and green sandpipers, is closely allied. For methods of shooting see SANDPIPER.

Yellowplush Papers. The, a series of satirical papers by William M. Thackeray, which appeared in 'Fraser's Magazine' in 1837-8, as 'The Yellowplush Memoirs,' and in book form in 1841.

Yellows, a disease of the peach (q.v.).

Yellowstone, formerly *Subletts*, a lake in the Yellowstone National Park (q.v.), at the northeast base of the Rocky Mountain range. It has an elevation of nearly 7,800 feet above sea-level. It is irregular in form, having extensions called West Arm, South Arm, and South-East Arm. The Yellowstone River flows through the lake, or as sometimes given, the lake is an expansion of the river. It is about 20 miles long and 15 miles wide.

Yellowstone, a river which has its rise in the Shoshone Mountains, in the northwestern

part of Wyoming, near lat. 44° N. It flows north, entering the Yellowstone National Park (q.v.) at the southeast corner, and passes through Yellowstone Lake, which is usually called an expansion of the river. From the lake the course is northeast, east, then north-east to the Missouri River, which it enters at Buford, on the boundary between Montana and North Dakota. The total length of the stream is about 1,000 miles. It is navigable for nearly 800 miles from its junction with the Missouri. The largest tributaries come from the south and are Big Horn, Powder, Rosebud, and Tongue rivers. The Grand Cañon of the Yellowstone (see YELLOWSTONE NATIONAL PARK) is one of the wonderful sights in a region of wonderful scenery.

Yellowstone National Park, a government reservation in the northwestern part of Wyoming and extending into Idaho and Montana about 11 miles along the western boundary of the park and into Montana about three miles along the northern boundary. In 1872 Congress set apart 3,575 square miles as 'a public pleasure ground and a game preserve.' In 1891 a tract of nearly 2,000 square miles was added to the east and south, making the total area 5,575 square miles. The mean altitude of the plateau portion is 7,800 feet. The 'Continental Divide' passes through from the south-east to the northwest, and the 'Rocky Mountain Divide' through the western part. Surrounding the park are numerous snow-clad mountains; on the south are the Shoshone Mountains, the Big Game and Teton ranges, on the east an extension of the Shoshone and on the southwest the Teton Range, the Big Bend Ridge on the west, and the Gallatin Range, part in the park, on the northwest. Some of the high peaks on the east are Index, 11,740 feet; Saddle Mountain, 10,676; Sunlight, 10,678; Fortress Mount, 12,073; and Ishawooc Cone, 11,840. Within the limits of the park is the Absaroka Range on the eastern border, with numerous vast peaks; as Table, Humphrey, Schurz, Langford, Chittenden, Cathedral, and Stevenson. In the northeast, and inside the Absaroka Range, are the Specimen Ridge and the Mirror Plateau. In the northern and southern parts of the park are lofty elevations; Mount Holmes of the Gallatin Range and Bunsen Peak are among the highest. In the southern part of the park is Sheridan Mountain, 10,385 feet high, the highest point of the Red Mountains. This elevation was named in honor of Philip H. Sheridan. A large part of the peak is formed of porphyry of a purple-pink color. Mount Washburne in the north is noted as the peak from which large portions of the park may be seen. It was named in honor of H. D. Washburne, who explored this region in 1870. There are over 20 high peaks within the limits of the park. The central plateau is composed of vast quantities of lava, in some places 2,000 feet deep. The Absarokas Range are made up of volcanic rocks, and nearly every part of this peculiar range shows the marks of having gone through a period of volcanic action. Sheridan in the south and Washburne in the north have been active volcanoes. Between Yellowstone and Shoshone lakes is a volcanic ridge about 255 feet in height. Six miles from the Grand Cañon of the Yellowstone is Sulphur Mountain, an immense mound of pure sulphur

YELLOWSTONE PARK

Terraces built by the overflow of Geysers (Mammoth Hot Springs)

YELLOWSTONE NATIONAL PARK

crystal with a number of steaming springs at its base.

Rivers and Lakes.—The "Continental Divide" marks the land-line of separation of the waters of the Atlantic and the Pacific. The headwaters of several large rivers are in the park; Yellowstone, Snake, Lewis, Madison, and Shoshone are some of the streams which have headwaters here. The Yellowstone River (q.v.), Missouri River's longest tributary, rises or passes through Yellowstone Lake, for a stream which enters the lake on the opposite side is, also, called Yellowstone. The Grand Cañon of the Yellowstone is one of the wonders of this "Wonderland." Its walls on one side are 2,000 feet, and on the other side there is a gradual descent half way down of sliding cinnabar and other delicately tinted chalky formations, broken at intervals by towering pinnacles of mineral rock, which stand out in bold relief against the brilliant background. These pinnacles take on many fantastic forms, inspiring the delusion that one is looking down upon the decaying splendors of antique architecture. From the base of these solemn sentinels, the descent to the water line is as abrupt as from surface to torrent on the opposite side. Far below winds the foaming current of white-crested wavelets spread out like a silvery band. Though the channel is 160 feet wide, it appears no larger than a brook. The whole volume of water breaks over a ledge, in the centre of which stands a huge black boulder which divides the waters for a few feet, and again uniting they fall 370 feet. Showers of spray are sent up, which when touched by the sunlight look like innumerable and varied colored jewels. Another falls above the main waterfall, is of considerable height and great beauty, and above are a series of cascades. The Grand Cañon is about 10 miles long. Tower Falls are so named on account of a mass of stone, about 100 feet from the verge of the precipice. The water below flows over a ledge about 150 feet high, and falls in solid sheets. Belcher River drains the southwestern part of the park. Madison, another tributary of the Missouri, has its source at the confluence of the Gibbon and Fire Hole rivers in the western part. In the northwest is the Gardiner River, a branch of the Yellowstone. Yellowstone Lake (q.v.), the largest body of water in the park, is said to have 300 miles of shore line, but it never has been fully explored. It certainly is the gem of the lakes, set as it is in a series of mountain peaks, with pine-clad slopes and snow-crowned summits. The monotony of its crested waves is broken by a verdure-clad island, Frank Island, giving it the appearance in summer of an emerald in a setting of brilliants. Shoshone Lake, next in size, is west, and Heart Lake is south of Yellowstone. North of Yellowstone is a group of small lakes, the largest of which is White Lake. They are northwest of Plican Cone. Near Mount Chittenden is Turbid Lake.

Geysers and Hot Springs.—The Yellowstone Park is famous for its numerous geysers; it is one of the four regions in the world where there are groups of large geysers. There are three geyser basins located in the valley of the Fire Hole River, at an average altitude of 7,000 feet above the sea-level; Upper Geyser, Middle Geyser, and Lower Geyser. The Upper, or Great Geyser basin, is the most active. Here are located the great spouters, conspicuous among

which are the Giant, Giantess, Castle, Saw Mill, Bee Hive, Lion, Grand Cornet and Cub, and last, but by no means least, Old Faithful. They are all appropriately named. The Giant and Giantess are so called on account of the immense size of their craters and the force of their action; the Bee Hive and Castle because of the peculiar formation of their cones; the Saw Mill and Lion from the roaring noise they make when in a state of activity; and Old Faithful on account of the regular discharges of steam and water at intervals of 64 minutes. One can rely absolutely on Old Faithful giving an exhibition every hour and four minutes. The stated intervals of activity have not varied in the memory of the oldest visitor to the park. Other geysers are variable in the time of their action; all are subject to changes. The Bee Hive is becoming more active every season. It gives an exhibition two or three times every 24 hours. The Giant and Giantess and Castle can not always be relied upon, but they make a magnificent display when in action. The Giant averages an exhibition about every six days and the Giantess about every 11 days. Near the main cone of the Giant Geyser is a small fissure, which seems to do for the Giant what an escape pipe does for a large boiler. When the chambers of the main crater become fully charged, short puffs of steam come hissing through this fissure. The grandeur of the spectacle which follows passes description. The interior forces seem to combine in making a display of power. Accompanying a stunning shock, caused by the volume of steam escaping, a column of water about 10 feet in circumference is thrown up to a considerable height, and emits a dense cloud of steam, so that it is difficult to see what appears in the centre to be a massive marble pillar. But the steam soon floats away and a column of great beauty stands revealed in all its grandeur. In a few seconds comes another change, the column is shattered, the law of gravity asserts itself, and the great body of water which went up in a grand column falls in showers of spray. The greater part of the water returns to the crater, and the overflow is carried off by Fire Hole River, a stream well named, as it flows rapidly through three basins fed by many boiling springs and numerous geysers.

There are no cone geysers in the Middle Geyser basin. The great wonder of the Middle basin is "Hell's Half-Acre." This is located on the bank of Fire Hole, and is a steaming abyss, about 30 feet deep, in a limestone formation. Four or five times each day, at irregular intervals, it gives most astonishing exhibits. A short distance from "Hell's Half-Acre" is a boiling lake, the waters of which are a beautiful blue. The blue liquid-overflow winds over formations which for years have been changing in form and color, making a sight the like of which is nowhere else in the world. The reflection of the trees and hills in the colored water adds to the picturesque beauty of the scene. The "Devil's Paint Pot" is a boiling caldron of many colored clays, which bubble and steam and change their colors in a way most interesting. The Mammoth Hot Springs are in the northern part of the park, not far from Cinnabar, the railroad station in Montana. They are somewhat similar to the springs in the Fire Hole basin. The deposits left by the water have built up scalloped terraces. Some of the results of their activity

YELLOWSTONE NATIONAL PARK

exist in a marked degree on the banks of the Gardiner River. There are places where the water from the geysers is no longer changing the terrace formations, and which seem to be over caverns as indicated by the sound of footsteps. In some parts caverns have been explored, and found to contain many beautiful specimens of stalagmites and stalactites. The springs of this locality are as varied in color and form as in activities. The "Goddess of Liberty" is a mass of limestone, 40 or 50 feet high, and shaped like the cap of the Goddess of Liberty. The Mud Geysers, north of and near Yellowstone Lake, are what their name indicates. At irregular intervals mud and water are shot up quite a distance. This slimy substance falls on the dead cedars which have been killed by the hot substance; but that evergreen cedars grew here shows that vegetation existed long before the present conditions. There are geysers near Heart Lake and in other parts of the park. There are nearly 100 active hot springs and geysers within the park. The geysers change, some becoming extinct, and new ones appearing. In 1878 a large geyser made its appearance in the Norris Basin, near the headwaters of the Madison River. Hot springs are found everywhere in the park; on mountains, in valleys, in the beds of lakes and rivers, near cañons, and near cold water springs. They vary in size, some cover acres, others only inches of surface. There are also a large number of mineral springs and numerous springs of clear cold water. The whole park and much of the adjoining region are volcanic.

Climate.—The climate is not as severely cold as in other parts of the Rocky Mountain region of the same altitude. The winter season practically begins with September or the last of August. The mean temperature in January is about 20°; occasionally the temperature falls to 30° below zero. The summers are short; vegetation begins to grow in May and in July has reached its most luxuriant state. In the last of August the change from summer to winter is usually sudden. In July the mean temperature is 62°; sometimes in summer the temperature rises to 96°. A hot day in summer may be followed by a cold night, even frost appearing. On the plateau the average annual rainfall is 20 inches.

Flora.—Nearly all the park area is covered with forests, chiefly composed of conifers. The treeless regions are the summits of the high mountains, the marshy bottoms, and the steep rocky slopes. The black pine is the most common; in some places there are forests composed almost wholly of black pine (*Pinus Murrayana*), which here do not attain any great size. The balsam is found on the high plateaus, and varieties of fir and spruce are abundant. Forests exist at an elevation of 9,700 feet. Grasses are found on the plateaus, and the herbaceous vegetation found in the Rocky Mountains. Above the timber line the vegetation is about as in other parts of the summits of the Rocky Mountains. The gentian is one of the favorite flowers of this section. Near the hot springs the vegetation is affected by the overflow and other causes; it is stunted and in some places has been killed entirely. Petrified trees are found in the southwest.

Fauna.—The wild animals of the park are protected by government laws, and as a conse-

quence are becoming more numerous than in other parts of the Rocky Mountains. A herd of buffalo is one of the features of the place. The animals found here are deer, antelopes, elk, mountain lions (pumas), beaver, black and brown bears, and moose. Sheep are found on the high lands. Grouse is found in some parts, but there are not many birds in this region. Fish abound, trout is in many streams.

Government and Improvements.—Since 1872 the government has had entire control of a portion of what is now the Yellowstone National Park, and later took control of additional lands, and now has entire jurisdiction over all the park. The administrative officials are under the Secretary of the Interior. An army officer is the superintendent in direct charge, and he has as his aids a detachment of Federal troops. On 1 July 1900, the Secretary of the Interior gave to the public the following instructions:

The following rules and regulations for the government of the Yellowstone National Park are hereby established and made public pursuant to authority conferred by section 2,475, Revised Statutes, United States, and the act of Congress approved 7 May 1894:

(1) It is forbidden to remove or injure the sediments or incrustations around the geysers, hot springs, or steam vents; or to deface the same by written inscription or otherwise; or to throw any substance into the springs or geyser vents; or to injure or disturb, in any manner, or to carry off any of the mineral deposits, specimens, natural curiosities, or wonders within the park.

(2) It is forbidden to ride or drive on any of the geyser or hot spring formations, or to turn loose stock to graze in their vicinity.

(3) It is forbidden to cut or injure any growing timber. Camping parties will be allowed to use dead or fallen timber for fuel.

(4) Fires shall be lighted only when necessary, and completely extinguished when no longer required. The utmost care should be exercised at all times to avoid setting fire to the timber and grass, and any one failing to comply therewith shall be punished as prescribed by law.

(5) Hunting or killing, wounding or capturing of any bird or wild animal, except dangerous animals, when necessary to prevent them from destroying life or inflicting an injury, is prohibited. The outfit, including guns, traps, teams, horses, or means of transportation used by persons engaged in hunting, killing, trapping, ensnaring, or capturing such birds or wild animals, or in possession of game killed in the park under other circumstances than prescribed above, will be forfeited to the United States, except in cases where it is shown by satisfactory evidence that the outfit is not the property of the person or persons violating this regulation, and the actual owner thereof was not a party to such violation. Firearms will only be permitted in the park on written permission from the superintendent thereof. On arrival at the first station of the park guard, parties having firearms will turn them over to the sergeant in charge of the station, taking his receipt for them. They will be returned to the owners on leaving the park.

(6) Fishing with nets, seines, traps, or by the use of drugs or explosives, or in any other way than with hook and line, is prohibited. Fishing for the purposes of merchandise or

BRIDAL-VEIL FALL IN THE YELLOWSTONE PARK

YELLOWTAIL—YENIKALE

profit is forbidden by law. Fishing may be prohibited by order of the superintendent of the park in any of the waters of the park or limited therein to any specified season of the year, till otherwise ordered by the Secretary of the Interior.

(7) No person will be permitted to reside permanently or to engage in any business in the park without permission, in writing, from the Department of the Interior. The superintendent may grant authority to competent persons to act as guides and revoke the same in his discretion, and no pack trains shall be allowed in the park unless in charge of a duly registered guide.

(8) The herding or grazing of loose stock or cattle of any kind within the park, as well as the driving of such stock or cattle over the roads of the park, is strictly forbidden, except in such cases where authority therefor is granted by the Secretary of the Interior.

(9) No drinking saloon or bar room will be permitted within the limits of the park.

(10) Private notices or advertisements shall not be posted or displayed within the park, except such as may be necessary for the convenience and guidance of the public, on buildings on leased ground.

(11) Persons who render themselves obnoxious by disorderly conduct or bad behavior, or who violate any of the foregoing rules, may be summarily removed from the park, and will not be allowed to return without permission, in writing, from the Secretary of the Interior or the superintendent of the park.

Any person who violates any of the foregoing regulations will be deemed guilty of a misdemeanor, and be subjected to a fine, as provided by the act of Congress approved 7 May 1894, "to protect the birds and animals in Yellowstone National Park and to punish crimes in said park, and for other purposes," of not more than one thousand dollars, or imprisonment not exceeding two years, or both, and be adjudged to pay all costs of the proceedings.

Prior to 1870 little was known about the region now included in the park. In 1870 H. D. Washburne, surveyor-general of Montana, and G. C. Doane, an army officer, explored this region and gave the first report of the wonderful springs and geysers. In 1872 the government sent Ferdinand V. Hayden, United States geologist, and a number of assistants, to explore this region. The place is visited annually by thousands of tourists and accounts of this wonderful park have been published in all languages.

Consult: 'Wonderland,' an annual published by the Northern Pacific Railroad; Chittenden, 'Yellowstone National Park'; Richardson, 'Wonders of Yellowstone'; United States Geological Survey.

Yellowtail, or *Bianquillo*, a trachinoid fish (*Caulolatilus princeps*) of the coast of Southern California and southward, allied to the Atlantic tilefish (q.v.), which reaches a length of 40 inches. It abounds about rocky parts of the coasts, is good food and interesting as a gamefish. Several other fishes in various parts of the world are called yellowtails, in reference to the yellow or orange color of the tail fin.

Yellowthroat. See **MARYLAND YELLOWTHROAT**.

Yemassee, yēm-sē', The, a romance of South Carolina in the colonial period, by William Gilmore Simms, published in 1835. The leading events of the tale are in accordance with history. The Yemassee are a powerful tribe of Indians whose hunting grounds are gradually encroached upon by the English colonists, who, by purchases, seizures, and intrigues, presently change the feeling of friendship with which their advent was greeted, into fear, and finally into savage revolt.

Yemassee War. See **COLONIAL WARS IN AMERICA**.

Yem'en, Arabia, a division occupying the southwest angle of the peninsula, and known both to the ancients and moderns as Arabia Felix (Arabia the Happy), from a mistranslation by Ptolemy of *Yemen*, which does not signify happy but the land lying to the right of Mecca. Yemen, in the widest sense, is bounded on the west by the Red Sea, on the south by the Gulf of Aden, on the north by Hejaz and Nejd, and on the east by Hadramaut. It comprises two regions physically distinct: the Tehama or Lowland, lying between a chain of mountains which extends throughout the country and the west coast; and an elevated mountainous tract to the eastward of the former. The Tehama varies in breadth from 10 to 30 miles, and is a barren desert wherever it is not irrigated by the mountain streams. The mountains rise abruptly from the desert plain, enclosing valleys of great luxuriance. The table-land in the interior has an estimated elevation of 4,000 feet, and some of its mountain groups, as Sabar, south of Taas, attain a height of 7,000 to 8,000 feet. The loftiest of these mountains are covered with forest to the summit, and the table-land abundantly produces coffee, dates, aenna, tobacco, and other productions of rather a warm temperate than a torrid region. Yemen, considered in the extent above indicated, has no longer a political existence; the frontier provinces have in some instances become independent, and the Yemen proper of the present day, or the Turkish vilayet known by this name, does not embrace above two thirds of the territory formerly included under the same general title. Its approximate area is 77,200 square miles. Yemen, taken collectively, still bears unmistakable traces of its ancient superiority in wealth and civilization. In its numerous well-built towns are many rich merchants, while in the well-populated rural districts the peasantry are generally in easy circumstances. There are two great schools or universities, one at Zebid for Sunnites, and another at Damar for the Zeidés. The principal towns are Sana, the capital Mocha, and Aden, which last is now in the possession of the British. Pop. 750,000. See **ARABIA**.

Yembo-el-Bahr, yēm'bō-el-bār, Arabia. See **YAMBO**.

Yen, a Japanese coin issued in 1, 2, 5, 10, and 20 yen pieces (gold). A gold yen is equal to 49.8 cents in United States gold.

Yenikalé, yēn-ē-kā'lā, Strait of, called also Strait of Kaffa and Strait of Kertch, Russia, connects the Black Sea with the Sea of Azov; it is about 25 miles long and from 2½ to 8 miles broad, but in some places is so shallow as to leave a channel of little more than two fathoms deep.

Yenisei, yén-t-sá't, Siberia, the longest river of the region, formed by numerous streams from the mountain ranges bordering the Chinese and Russian empires. It has at first a circuitous, and then an almost direct northward course of about 3,400 miles, finally reaching the Arctic Ocean through the long estuary, and gulf of the same name. Its breadth varies from 3,000 feet to 14 miles in its estuary which is 140 miles long, and its depth varies from 11 to 90 feet. The area of its basin is estimated at about 1,000,000 square miles. A canal connects it with the Ob. The principal towns on its banks are Minusinsk, Krasnoiarak, Yeniseisk, and Tarukanak; it is navigable to the last-named town for large vessels. The waters of the Yenisei are clear and rich in fish. They are navigated by paddle steamers, drawing barges, and by a number of five or six cornered flat-bottomed boxes which convey flour down stream, and are broken up at their destinations. The Yenisei receives from the right the Upper Tunguska or Angara (the outlet of Lake Baikal), the Irkut, Middle Tunguska, and Lower Tunguska. Nordenkjöld's voyage in the summer of 1875 from Tromsø to the mouth of the Yenisei opened up a trade by sea with northern Siberia, in which a number of vessels are now engaged, finding six weeks in summer when the passage to and from the Yenisei can be made with little difficulty.

Yeniseisk, yén-t-sá'tsk, Siberia, (1) a town in the government of the same name on the left bank of the Yenisei, 200 miles north of Krasnoiarak. It has several churches, a monastery, museum of natural history and archaeology, and a public library. It is in the northern gold-mining region, has a custom-house, an extensive trade, particularly in furs, and an annual fair. Pop. about 13,000. (2) A province in the government of Irkutsk, bordering on the Arctic Ocean, bounded east by Yakutsk and Irkutsk, south by Mongolia, and west by Tomak; area, 987,186 square miles; capital, Krasnoiarak. The south part of the province is occupied with the Altai Hills and their offsets. In the Yenisei valley considerable tracts are under tillage, but north of the town of Yeniseisk this is succeeded first by pasturage, then by stretches ever more and more desolate, to the frozen tundras. The chief river is the Yenisei. Smaller streams are the Taimyr, Katanga, and Anabar, which, like the Yenisei, form great gulfs at their mouths. The gold washings of Yeniseisk occupy 12,000 to 15,000 men and several thousand horses. Of the native tribes, who live by hunting, fishing, and trade in fur, the chief are Samoyedes and Tungus.

Yeo, yō, Sir James Lucas, English naval officer: b. Southampton, Hampshire, 1782; d. at sea 1818. Entering the navy at 11 he was present at the siege of Genoa in 1800, and while in command of a force of English and Portuguese captured Cayenne, French Guiana. In 1813 he became commander-in-chief of the English naval force of the Great Lakes and soon came into conflict with the American ships of war there. After several indecisive engagements he captured Oswego, 6 May 1814, which the Americans soon retook, and afterward blockaded Commodore Chauncey at Sackett's Harbor. In the following year Yeo was made commander-in-chief of the English fleet on the west coast of Africa.

Yeoman, yō'man, a term of early English origin formerly applied to a feudal attendant or servant, but in the 15th century and subsequently denoting a small freeholder below the rank of gentleman. The term yeoman was given also to the 40 shillings freeholder, and commonly to any small farmer or countryman above the grade of laborer. The term is also familiar in the titles of functionaries in royal households, such as yeoman usher of the black rod, yeoman of the robes, etc.

Yeomanry, a force of volunteer cavalry first enrolled in Great Britain during the wars of the French Revolution, and consisting to a great extent of country gentlemen and farmers possessing their own horses and requisite equipment. They are liable to be called out in aid of the civil power in case of riot at any time; in case of actual invasion, or the appearance of an enemy on the coast or during a rebellion, they may be assembled for actual service; they are then subject to the Mutiny Act and Articles of War, and may be called upon to serve in any part of Great Britain. During permanent service they receive cavalry pay and an allowance for forage. They undergo six days' training, and must attend a certain number of drills yearly, for which they receive 7s. a day as subsistence allowance, and 2s. for forage. Arms and ammunition are provided by the War Office, and there is an annual allowance of £2, or about \$9.74, per man; but each man has to provide his own horse, which is exempt from taxation. For their services during the Boer war, 1899-1900, they received the title of Imperial Yeomanry. Colonial Yeomanry have been enlisted for the defense of the British colonies.

Yeomen of the Guard, in England, a corps of veteran soldiers of stately presence, employed on state occasions in conjunction with the gentlemen-at-arms as the bodyguard of the sovereign. The yeomen were constituted a corps in 1485 by King Henry VII., and they still wear the costumes of that period. The officers of the corps are a captain, ordinarily a peer, a lieutenant, and an ensign—all old army officers. There are also a "Clerk of the Cheque" and four "Exons," besides non-commissioned officers (messengers, sergeant-majors, yeoman bed-goers, yeoman bed-hangers), and 100 privates. The Beef-Eaters or Warders of the Tower, are, contrary to common belief, an entirely different corps, but since the reign of Edward VI have been privileged to wear the yeoman's uniform, without the shoulder belt. See **BEEF-EATERS**.

Yerba Maté. See **PARAGUAY TEA**.

Yerkes, yér'kēs, Charles Tyson, American capitalist: b. Philadelphia, Pa., 25 June 1817; d. New York City, 20 Dec. 1905. He received a secondary education in Philadelphia, was for a time in the flour and grain business, in 1839 became a stock-broker, and in 1861-66 was in banking, first in Philadelphia, and from 1881 in Chicago. In 1871 he was obliged to make an assignment, but by fortunate investments he soon financially re-established himself, and became prominently connected with the Philadelphia street-railway system. After his removal to Chicago he acquired a controlling position in its street-railway system. In 1890-3 he was a prominent member of the board of directors of the World's Columbian Exposition at Chicago, rendering particular service to the

YERKES OBSERVATORY — YEZO

department of fine arts, to whose exhibit he loaned his fine collection of paintings. Among his later enterprises was that connected with the London system of underground railways. He gave to the University of Chicago funds for the buildings and instruments of the Yerkes Observatory (q.v.), with its famous telescope. This was described by Newcomb as "one of the most munificent gifts ever made for the promotion of any single science."

Yerkes Observatory, astronomical observatory of the University of Chicago (q.v.), located on Lake Geneva, near William Bay, Wis. It was founded in 1892 by Charles Tyson Yerkes (q.v.), who presented to the University funds sufficient for its building and equipment. It has a refracting telescope with an aperture of 40 inches, the largest in the world. The observatory is used chiefly for advanced work in astronomy, for which its equipment offers exceptional facilities.

Yew, evergreen coniferous shrub or tree, of the genus *Taxus*. The leaves are flat needles arranged in two ranks to the right and left of the stem, but in a horizontal plane. The flowers are dioecious, and have no perianth; the male inflorescences are composed of a few stamens partly united at the apex of a scaly, axillary stalk, with shield-shaped bracts forming a spherical head. The female flowers are axillary, naked ovules seated on a fleshy annular disk, which becomes cup-shaped and scarlet, and nearly encloses the bony seed. The European yew, a tree famous in the annals of Old World gardens, is the *Taxus baccata*. It is readily recognizable, by its lustrous foliage, so dark a green as to appear velvety, and almost black, in the shadows. When rather young the typical yew has a broadly pyramidal head, but in its old age it becomes ragged and broken, not unlike an aged hemlock. Some of them have attained to a great age, and they reach to a height of 100 feet, and sometimes to a diameter of 10 feet. In cultivation there are several varieties of yew, including the Irish with fastigiate branches, and columnar habit, and the golden yews, with foliage, which, to a certain extent, is yellow. The dark yew was a favorite tree for planting in church yards. It is even now a common plant in European cemeteries, and has been for centuries a symbol of mourning at funerals, and especially at those of unhappy lovers.

Lay a garland on my bier
Of the dismal yew;

This couplet in the 'Maid's Tragedy' is an allusion to this custom. In India the yew is a sacred tree, its wood and gum being burned as an incense, and branches of it carried before ceremonial processions. Although the sweet and juicy scarlet aril of yew fruit does not seem to be poisonous, the enclosed seed is regarded with suspicion, especially when eaten by children, in any quantity. Young branches of yew, too, are dangerous to cattle, which are not seldom killed by feeding upon them. The trunks of yews are twisted, ridged, and gnarled, and the shreddy bark has the rich red-brown tone of an old cedar. The wood is hard, with an orange red or brown heart, which takes a fine polish and is valued for cabinet work and veneers; since it is also fine and close-grained,

flexible, and elastic, easy to split and durable, yew-wood was the chosen material for the bows of the English archers, and no other wood has ever equaled it for that purpose. The Indian tribes of the northwestern American coast arrived at the same conclusion in regard to the beautiful *Taxus brevifolia*, indigenous to that region, and similar in appearance and size to the European tree. It was used by them for bows, spear-handles, paddles, and fish-hooks, and is the most durable timber that the white man can find for his fence-posts. There is another arborescent American yew, found in Florida, a bushy tree (*T. floridana*) with many stout spreading branches and a short trunk. It rarely exceeds 30 feet in height. A Japanese species (*T. cuspidata*), with a bright red bark, is now being introduced to cultivation, and is of bushy habit, and more hardy and successful than the European yew. This is a great favorite with the Japanese, who clip it into fantastic shapes. The most familiar yew in Canada and the eastern United States is the *T. canadensis*, a very low, shrubby species with decumbent branches radiating in every direction and forming thickets hard for a man to travel through, but a first-rate cover for grouse. It grows in moist lands under the shade of trees, and is readily recognized by its dark foliage and the glowing, crimson, oblong, cup-like fruits.

Yezd, yēzd, or Yasd, Persia, (1) A town, capital of a province of the same name, in an oasis in a sandy plain, 190 miles southeast of Isfahan. It is about five miles in circuit; consists of an old town, enclosed by a wall and ditch, defended by a citadel, and entered by four gates; and of a larger new town or suburb, which has risen up in a straggling manner, to meet the wants of the increasing population. Within the citadel are a palace, the principal mosque, several other public buildings, and the residences of the chief men of the district. The bazaars are spacious and well supplied, particularly with the staple manufactures of the town itself, consisting of silk stuffs, velvets, cottons, coarse woollens called *samsad*, loaf-sugar, and sweetmeats. The position of Yezd, on the edge of a desert, at the junction of the principal caravan routes, makes it an important commercial entrepôt for the surrounding countries. Pop. 40,000, of which about a tenth are Zoroastrians or fire-worshippers. (2) The province has an area of about 20,000 square miles, and its population is estimated at 100,000.

Yeseodees, yēr'ē-dēz. See RELIGIOUS SECTS.

Yezo, yā'zō, Ezo, or Hokkaido, hōk-kī'dō, Japan, the northernmost of the four main islands of the empire, separated from Hondo on the south by Tsugaru Strait, from Sakhalin on the north by La Pérouse Strait, while Yezo Strait divides it from Kunashiri, the southernmost of the Kurile Islands; area, including dependent islands, 36,300 square miles. The capital is Sapporo; Hakodate, Mororan, and Otaru are other large towns and open ports. Yezo is curiously like a skate-fish in shape. The centre of the island is but little known, though it has been crossed twice or thrice by Japanese and European explorers. It is traversed by chains of mountains, the principal summits being Tokachi-dake, 8,200 feet; Shiretetsi-yama, 7,874 feet; Ishikari-dake, 7,710 feet; Sapporo-dake, 6,500 feet; and Komaga-take, 3,830 feet. Much

YOGDRASIL—YIDDISH LANGUAGE

of the island is volcanic, especially in the east. The chief rivers are the Ishikari and Tesahio, flowing into the Sea of Japan; and the Tokachi, flowing into the Pacific Ocean. The chief bays are Volcano Bay, in the south; Ishikari Bay, in the west; Shari and Wafish bays, in the northeast. Yezo has a rigorous climate, being for six months of the year under snow and ice, two feet in the south to eight feet in the north. The original inhabitants of Yezo were probably pit dwellers, of whom distinct traces have been found at Sapporo, Nemuro, and elsewhere. After these came Ainos or Ainus, whose principal settlement is at Piratori, 30 miles east of Mororan. The bear festival in September is the great event of their year. The Ainos number 15,000, a population either stationary or decreasing; they are harmless, lazy, and drunken, and live mostly near the mouths of the rivers. The southern corner of the island was wrested from them in the 16th century, and Matsumae, now Fukuyama, in the extreme southwest, became in the next century the headquarters of Japanese rule. From 1600 to 1868 the southwestern portion of the island was in possession of a Daimio named Matsumai, and the Shogun was in possession of Hakodate. At the restoration in 1868 the supporters of the Tokugawa government made a last stand here, and were finally defeated at Hakodate. In 1871 the Japanese began active colonization, fearing aggression on the part of Russia, and a new department—the Colonization Department—was established to further these projects and much development work was done under the supervision of foreigners. This department, however, was abolished in 1881 and the country divided into prefectures, though its inhabitants do not as yet enjoy any electoral privileges. The fauna and flora of Yezo differ materially from those of the main island, the bear being a different species, resembling the grizzly. There are no monkeys; a species of grouse is found. The deer, once very plentiful, are now comparatively scarce. The Yezo pony, originally from Nambu on the main island, is hardy, and foreign blood has been introduced, promising good results. The forests furnish valuable timber. Coal, petroleum, and gold are found and worked to some extent. The official name Hokkaido, "Circuit of the Northern Sea," was bestowed in 1870, when it was brought under a special colonization department. An agricultural mission from the United States assisted in founding model farms, laying out roads, and building bridges. The capital was changed from Matsumae to Sapporo, which was provided with a railroad to Otarunai, its port, and to Poronai, the great coal district inland. An agricultural college, breweries, canning factories, beet-root sugar factories, etc., were established. The coal mines are worked by convict labor. A system of military settlements has of late years been put into force, partly with the view of furnishing a militia against possible invasion from Russia, which is supposed to covet the fine harbors of Yezo. The sheltered harbor of Mororan, on Volcano Bay, is now a naval harbor, to which a railway from Poronai mines has been built. The principal products of Yezo are coal, seaweed, sulphur, fish, the catches of salmon on the river Ishikari being sometimes enormous. Kerosene, beer, glass, and other articles

are manufactured, and internal communication is facilitated by a system of railways, either constructed or projected, joining all the important coast and interior towns. Pop. about 615,000, including 17,573 Ainos; of the administrative division, including the Kurile Islands, 621,000. See JAPAN.

Yggdrasil, *ig-drä-sil*, or *Ygdraal*, in Scandinavian mythology, the giant ash tree overspreading the whole world and reaching above the heavens. It binds together earth, heaven, and hell, and its roots stretch out to the Asa or Æsir gods in heaven, to the frost giants, and to the under world. A marvellous fountain springs up under each of these three great roots and in the tree, whose boughs drip continually with honey, dwell an eagle and the squirrel Ratatöskr. At its roots the serpent Nithögg gnaws, and between the serpent and the eagle runs the squirrel constantly endeavoring to provoke the two to strife. Certain writers detect in this myth a distortion of the story of the Cross, but the translator of Grimm says, "it were a far likelier theory, that floating heathen traditions of the world tree, soon after the conversion in Germany, France, or England, attached themselves to an object of Christian faith just as heathen temples and holy places were converted into Christian ones."

Yiddish Language. Yiddish, the Englishized form of German *Jüdisch* (Jewish), is one of the names applied to the various German dialects spoken by the Jews of German origin in the diaspora, in Russia, Rumania, Slavic and Hungarian Austro-Hungary, and in England, America, and South Africa, whither Russian and Rumanian Jews have been emigrating in the last 30 years. In Russia it is known under the name of *Jargon*, while philologically it is generally spoken of as *Judeo-German*.

No literary documents of any consequence bear upon the condition of this group of dialects previous to the 16th century, and even in the printed works up to a hundred years ago the literary norm seems to have attempted an approach to the literary German, though even then the deviation was considerable and fairly uniform. In the last century the spoken dialects have been asserting themselves in the literary productions, so that the uniformity no longer exists, each author writing in the variation familiar to him from childhood.

It seems that at first, in the Middle Ages, the German Jews employed the language of their Christian neighborhood without any change whatever; in their intercommunication with their coreligionists they transcribed this German with Hebrew characters and introduced, Germanizing them, such Hebrew words as were necessitated by the observances of the Mosaic faith. When the German Jews, in the 14th and 15th centuries, settled in what then was Poland, they were cut off from the rest of the German nation, and so their native dialects perpetuated themselves in the form in which they were brought from their homes. They were subjected, however, to the double influence of their Slavic neighborhood and the language of the Bible and the Talmud, to which the Jews devoted themselves with unwonted zeal. In vocabulary, the Yiddish is predominantly German, less than one-third having been derived

from Slavic, Rumanian, and Hebrew sources. In pronunciation, the influence of Russian and Polish is doubtful or less transparent, while Hebrew, instead of affecting it, was itself affected by the current pronunciation of Yiddish. In syntax and idiom, both the Slavic and the Hebrew have considerably modified the native German, without, however, obliterating the original German basis. At present, three chief varieties may be distinguished in the Yiddish of Russia, the Lithuanian, the Polish, and the Southern; the dialects in Austro-Hungary are more nearly related to the two latter, while the Rumanian is more akin to the Polish variety. In America all three varieties may be heard, but they are strongly influenced in vocabulary by the English, and in the periodic press the Lithuanian variety, affected by literary German, seems to supersede all other dialects. The three varieties correspond to their places of origin in Germany, the Lithuanian issuing from a Middle-German home, the other two from various Upper-German localities. The precise provenience has not yet been ascertained, as the linguistic study of Yiddish has heretofore been greatly neglected.

The chief differences between Yiddish and the modern German are these: Phonetically, Yiddish represents a mediæval stage of German when, for example, *i* and *ei* were still carefully distinguished, while *u* before a nasal had not yet changed into *o*; on the other hand, the consonantism, especially the treatment of *pf*, seems to correspond to a later stage. The vocabulary of Yiddish is rich in words only sporadically found in German dialects and common to the Middle-High-German literary language. The words from the Hebrew are phonetically treated as Yiddish words, while those from Russian and Polish, to some extent, underwent the changes due to the peculiarity of Yiddish, and present some interesting data to the Slavic scholar. In grammar, Yiddish has developed certain peculiarities which are common to various German dialects. Most prominent are the disappearance of final unaccented *e*, of the genitive case in the declension of the noun, of the imperfect tense in the verb. In syntactic structure, Yiddish resembles English, rather than German, and in English-speaking countries naturally adopts some of the English idioms. But, on the whole, Yiddish is an important group of German dialects, well worthy of a thorough study by the Germanic philologist.

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Ying-tse, ying'tsé', China. See NRU-CHUANG.

Ylang-ylang, Attar of, a perfume fully as exquisite and as precious as the much-praised attar of roses. The ylang-ylang tree attains a height of 60 feet and has drooping, greenish-yellow flowers three inches long and extraordinarily fragrant. The tree is common in the Philippines. It is found chiefly in the well-populated provinces and islands, and the natives say that it thrives best near the habitations of man. The propagation is plantations, by seed or cuttings, about 20 feet apart, each way (108 trees to the acre), is easy, and the growth rapid in almost any soil. The first flowers appear in the third year, the eighth yielding as high as 100 pounds, the bloom occurring every month. The greatest yield is from July to December. The process of converting the long, greenish yellow, fragrant petals of the flower into essence is by the simplest form of distillation, using merely water and the choicest flowers. No chemicals of any kind are required.

Ymir, é'mír, in Scandinavian mythology, the personification of Chaos, or the first created being, produced by the antagonism of heat and cold in Ginnungagap, the primeval abyss. Slain by Odin and thrown into Ginnungagap, his flesh was transformed into land, his bones becoming the mountains, his blood the rivers and lakes, his hair the forests, while his skull constituted the heavens, and his brains the clouds.

Yoder, yó'der, Robert Anderson, American Lutheran clergyman and educator; b. Lincoln County, N. C., 16 Aug. 1853. Graduated from North Carolina College in 1877, he was ordained to the ministry of the Lutheran Church in 1879, and after study at the seminary of the Church in Philadelphia, held pastorates in North Carolina. From 1888 to 1891 he was president of Concordia College (Fort Wayne, Ind.), and from 1891-1901 was president of Lenoir College (Hickory, N. C.). He was also pastor of St. James' Church at Newton, N. C.; in 1902 was president of the United Synod of the South at Charleston, and in 1904 at New Market, Va., and is now pastor of Saint Andrew's Church, Hickory, N. C.

Yoga, yó'gā, one of the six schools or systems of Brahmanical philosophy, that of Patanjali, the essence of which is meditation. It believes in a primordial soul which has had existence from an earlier period than primeval matter, and holds that from the two arose the spirit of life (Mahanatma). Theoretically at least, its devotees can acquire even in this world entire command over elementary matter by cer-

Yama ascetic practices, such as long continued suppression of the respiration, inhaling and exhaling the breath in a particular manner, sitting in 84 attitudes, fixing the eyes on the tip of the nose, and endeavoring, by the force of mental abstraction, to unite themselves with the vital spirit which pervades all nature and is identical with Siva. When this mystic union is effected, the Yoga can make himself lighter than the lightest, or heavier than the heaviest substance, or as small or as large as he pleases; he can traverse all space, can become invisible, can equally know the past, the present, and the future, and can animate any dead body by transferring to it his own spirit; finally he becomes united with Siva, and is exempt from the necessity of undergoing further transmigrations. See **BRAMHANA**.

Yoke, a piece of timber, hollowed or made curving near each end, and fitted with bows for receiving the necks of oxen, by which means two are connected for drawing. A frame of wood fitted to a person's shoulders for carrying a pail, etc., suspended on each side. The ancients regarded the yoke as a symbol of slavery, and it was customary for vanquished armies to pass under a yoke, formed like a gallows, of two upright spears, and a third fixed transversely at top.

Yokohama, yō-kō-hā'mā, Japan, the chief seaport and treaty-port of the empire, on the Bay of Tokio, about 17 miles southwest of Tokio, of which it is the port. Yokohama is of modern growth, its rise being due to the opening of Japan to foreign commerce and to the establishment here of foreign merchants, consuls, etc., after the adjacent Kanagawa was declared a treaty-port. It is in general poorly built, with houses mostly of wood. The dwelling-houses and warehouses of the foreign residents, however, are of a superior character, and are built on the bluff facing the bay. The commercial buildings occupy the east of the town, the western part being the Japanese town, and the centre being occupied by the prefecture, custom-house, post-office, and other official buildings. The bay is very beautiful, and, though only an open roadstead, affords a good and commodious anchorage, not only to extensive mercantile shipping, but also to the naval squadrons of Great Britain, France, Germany, Russia, and other powers. Work on a large harbor was carried out in 1889-96, the main object of which was to prevent the gradual silting up of the anchorage; it is enclosed by two breakwaters $1\frac{1}{4}$ miles long, and an iron pier, 1,900 feet long, connected with the railway to the capital, 17 miles off. Yokohama is a centre for tourists visiting Japan. The imports into Yokohama in 1901 were valued at \$45,186,375, mainly sugar, metals and metal manufactures, cotton manufactures, kerosene, raw cotton, and woollens; the exports at \$68,305,235, mainly raw and manufactured silk, copper, tea, fish, cotton goods, fish-oil, and paper. The number of vessels entered in 1901 was 893, with a tonnage of 2,032,445, mainly British, Japanese, German, and American.

Yokosuka, yō-kō-soo'kā, Japan, town and naval station on the Bay of Tokio, 12 miles south of Yokohama. It is connected with Yokohama by rail and steamer, and with Kama-

kura and Tokio by rail. It has a spacious land-locked harbor, large dry docks, a naval arsenal, and ship-building yards suitable for the construction of large war vessels. About a mile from the town is the grave of Will Adams (q.v.), the first Englishman to enter Japan. Pop. about 31,000.

Yokuts ("Indians"), a group of about two dozen small tribes, forming the Mariposan linguistic stock of North American Indians, occupying an irregular area in central southern California from Fresno River in the north to near the southern extremity of Tulare Lake in the south, and between the Sierra Nevada in the east and the Coast Range in the west; also a strip, 10 to 20 miles wide, extending southeastward from Tulare Lake along the eastern base of the latter range to Mount Pinos, about lat. 34° 45', together with an isolated area, occupied by the Cholovone division, in San Joaquin Valley from the Tuolumne northward. The tribes in general were segregated by the natural features of their territory, such as river valleys, and each tribe had its hereditary chief. Their villages consisted of a single row of tule-thatched, wedge-shaped houses, with a continuous *ramada* or shelter of brush along the front. In early times, when large game was abundant, hunting formed an important pursuit, but with the coming of the whites and the disappearance of the game they were compelled to resort almost exclusively to the products of the soil and of the streams and lakes, although rabbits and quail were always abundant and were commonly trapped. Seeds of various kinds were gathered for use as food, as also were grasshoppers, caterpillars, worms, and the larvæ of insects; dogs were raised for use also as food, and even skunks were not despised; but the coyote and the rattlesnake were always tabooed. Their basketry was excellent in shape, design, and execution, and formed their chief handicraft. The Yokuts women were chaste before the settlement of their country by the whites; marriage was perhaps by purchase, the husband residing at the house of his wife; infanticide was practised in cases of deformity; the dead were generally cremated. The Yokuts are now but a remnant of a once comparatively populous group of tribes. Early warfare with the Paiutes, who pressed them closely from the east, and later and more disastrous contact with white ruffians who found the Indians in their way, practically exterminated many of the tribes and probably wiped others away completely. Their present population is not known, but there are believed to be about 150 under the Mission Agency, and others are scattered over their old haunts, some of the tribes being represented by only half a dozen individuals or less.

F. W. Hodge,

Of the Smithsonian Institution.

Yon, yōn, Edmund Charles, French artist: b. Paris 2 Feb. 1836, d. there 26 March 1897. He was a pupil of Puget and Lequien. His first work was a series of wood engravings after Millet and others. He later gave his attention mainly to landscape painting. His works include 'A Road in Velizy'; 'The Banks of the Marne'; 'Before the Rain'; 'The Squall'; 'Morning'; and 'San Marco.' His paintings are distinguished for delicacy of coloring and shading.

Yongampo, yŏn-gāmp'a, Korea, a seaport on the left bank of the Yalu estuary, near Wiju, with a large and important harbor. It was used as a landing place by the Japanese during the Chino-Japanese war in 1894, and just prior to the Russo-Japanese war of 1904 was an important outpost of the Russian advance into Korea, and the headquarters of their timber-selling concession. Russia's strong protests against opening the port to foreign trade was one of the many events that hastened the war.

Yonge, yāng, Charles Duke, English historian; b. 1812; d. 1 Dec. 1891. He published: 'An English-Greek Lexicon' (1849); 'A New Gradus ad Parnassum of the Latin Language' (1850); 'History of the British Navy' (1865); 'France Under the Bourbons' (1866-7); 'Three Centuries of English History' (1872); 'Three Centuries of English Literature' (1872); 'A Life of Marie Antoinette, Queen of France' (1876); 'Life of Sir Walter Scott' (1888); etc.

Yonge, Charlotte Mary, English author; b. Otterbourne, Hampshire, 11 Aug. 1823; d. there 24 March 1901. She received a private education. She made her name widely known by the publication in 1853 of a novel entitled 'The Heir of Redclyffe,' which exercised an important influence on some leading minds of that time. She devoted part of the proceeds to fitting out a missionary ship for Bishop Selwyn. None of her later novels came up to the standard of her first work. Among the best of them are 'Katharine Ashton'; 'The Daisy Chain' (1856), the proceeds of which she devoted to founding a missionary college at Auckland, in New Zealand; 'Hopes and Fears'; 'The Little Duke'; 'The Prince and the Page'; and 'The Dove in the Eagle's Nest.' Her staunch attachment to the Church of England more or less colors all these works, and was also manifested, not only in the field of practical effort, but in the choice of the subjects of some other of her works, such as: 'Biographies of Good Women' (1862); 'Life of Bishop J. C. Patteson' (1873); 'John Keble's Parishes' (1898); and 'The Patriots of Palestine' (1898). Her remaining works include: 'Christian Names: their History and Derivation' (1863); 'Cameos from English History' (1869-99); 'History of Germany' (1877); 'History of France' (1879); 'Universal History for Young People.' For 30 years she edited a High Church magazine known as 'The Monthly Packet.' An illustrated edition of her more popular works in fiction appeared in 1888-9. Consult the 'Life' by Coleridge (1903).

Yonkers, yŏn-k'ēz, N. Y., city of Westchester County; on the Hudson River, and on the New York Central Railroad; north of and adjoining New York city. It has regular steamer connection, for passengers and freight, with New York and Albany, and is connected by electric lines with New York, Mount Vernon, New Rochelle, and many of the villages and cities on the Hudson.

Industries.—The good opportunities for shipment of goods by land and water have aided the industrial growth of the city. In 1900 (government census) Yonkers had 387 manufacturing establishments, capitalized for \$13,097,205 and employing 8,615 wage-earners, to whom were paid annually \$3,888,892. The total cost of material used each year, and including rents,

fuels, etc., was \$10,555,218. The value of the yearly products was \$19,580,324. The chief industries were 12 foundries and machine shops, capitalized for \$1,012,892 and producing annually goods to the amount of \$1,381,903; the annual output of patent medicines and compounds was valued at \$744,784. Other manufactures are confectionery, furniture, roofing materials, carpets, rugs, and hats. There are large coal yards, grain elevators, the Otis Elevator Company works, ship and boat building yards, bridge works, lumber mills, flour and grist mills, and carriage and wagon factories.

Municipal Improvements and Buildings.—Yonkers is built on a series of terraces which rise from the Hudson to an elevation of 426 feet above tide-water. The view from the elevated portions includes a long distance up and down the Hudson, the Palisades, and the beautiful valley to the east. In the residential part of the city are the homes of many New York city business men. The city has a frontage of nearly five miles on the Hudson, and extends along the Bronx River for about seven miles. The streets are broad, many of them paved, and well shaded. The city owns and operates the water-works. There are three small public parks maintained by the city, also two public bath houses, and, on the Hudson, a steel pavilion for recreation. There is an excellent sewer system. The principal public buildings are the government building, the library in Washington Park, the churches, schools, and charity institutions. The city-hall is of considerable historic interest; it was formerly the Philipse Manor and was built in 1752. Since 1868 it has been used as a municipal building. Another noted building is "Grey-stone," once the residence of Samuel J. Tilden.

Churches, Charitable, and Educational Institutions.—There are 30 churches, some of which are buildings of considerable architectural merit. The city has the Homoeopathic Hospital, Saint John's Riverside Hospital, Saint Joseph's Hospital, Lenox and Watts Orphan Home, the Hebrew Home for the Aged and Infirm, and private institutions. The educational institutions are Lowden and Halsted schools, Spencerian Business College, a public high school, established in 1882, public and parish elementary schools and kindergartens, a public library (building presented by Andrew Carnegie), the Hollywood Inn for Workingmen, with a library of 6,000 volumes, the Woman's Institute Library, and Saint Joseph's Training School for Nurses. Near the city limits are Saint Joseph's Seminary (q.v.), and Mount Saint Vincent Academy (R.C.). The latter is a school for girls.

Banks and Finances.—Yonkers has both national and state banks, the combined deposits amounting to approximately \$10,000,000. The expenditures for municipal maintenance and operations are annually about \$1,000,000. The chief items of expense are: for schools, about \$248,000; police department, \$91,000; fire department, \$74,500; interest on debt, \$144,500; municipal lighting, \$98,500; water-works, \$80,000; and streets, \$56,000.

History.—In 1650 Adrian Van der Donck and several Dutch families settled in what is now called Yonkers. The region around Yonkers then belonged to the Dutch. It became a part of Philipse Manor in 1672 and the town was called Philipseburg. The town of Yonkers

YONNE—YORK

was founded in 1768, and in 1895 it was incorporated as a village. The town was divided in 1872; the northern part was chartered as the city of Yonkers and the southern part was called Kingsbridge. In 1874 Kingsbridge became a part of New York city. Pop. (1890) 32,033, (1900) 47,931; (1910) 79,803, an increase of 66.5 per cent.

Consult: Scharf, 'History of Westchester County'; Allison, 'The History of Yonkers' (1896).

Yonne, yŏn, France, a northern interior department bounded by Seine-et-Marne, Aube, Côte-d'Or, Nièvre, and Loiret; area, 2,868 square miles; capital, Auxerre. The surface is generally intersected by low hills, sometimes barren, but usually covered with fruitful vineyards, which yield the famous Chablis, Joigny, Auxerre, and Tonnerre wines. Between the hills lie beautiful and productive valleys. The most elevated land is in the southwest, forming the water-shed between the basins of the Loire and Seine. The small part belonging to the former is drained by the Veille. All the rest belongs to the latter, which receives it chiefly by the navigable Yonne. The climate is temperate, and the air pure and healthful, except in some wet, marshy spots. The minerals include iron, red and yellow ochre, building-stone, lithographic stones, pavement, and potter's clay. The manufactures are of coarse woollens, woolen covers, serge, glue, etc. The trade is in corn, wine, vinegar, wood and charcoal, ship-timber, wool, cattle, iron, and ochre. Pop. about 325,000.

Yousafzai, yoo-soof'zi, or **Yusufzai** ('children of Joseph'), an important Afghan tribe, on the northwest frontier of India. Their territory includes about 2,000 square miles within the British district of Peshawar and also the hills beyond the north boundary, and their total number is estimated at 246,000, including 73,000 soldiers. The crops of the region are wheat, barley, millets, maize, cotton, and mustard seed. Iron, cattle, and wool are exported, and the transit trade is considerable.

Yor'ick, (1) The king's fool, whose skull is apostrophized by Hamlet in the fifth act of Shakespeare's tragedy of 'Hamlet.' (2) The pseudonym adopted by Laurence Sterne in 'A Sentimental Journey.' (3) The parson in Sterne's 'Tristram Shandy,' intended as a portrait of himself.

Yoritomo Minamoto, yō-rē-tō'mō mē-nā-mō'tō, Japanese soldier and statesman: b. 1146; d. 1199. He became about 1159 the leader of the military clan of Minamoto in its feud with that of Taira. In 1180 he assembled an army of considerable strength, and began operations against the Taira, whom in 1185 he completely destroyed in the naval battle off Dan-no-ura, not far from Shimonoseki. He became practically ruler of Japan, though nominally subject to the Mikado, was made (1192) Sei-i-tai sho-gun, established his capital at Kamakura, and laid the basis of the feudal system of Japan.

York, Cardinal. See STUART, HENRY BENEDICT MARIA CLEMENT.

York, Duke of, a title formerly conferred on the second sons of the kings of England. It was first borne, however, by **Edmund de Lan-**

cy, fifth son of Edward III., who was created Duke of York in 1365, and died in 1402. He was the founder of the house of York, in English history that of the "white rose," while his elder brother John, fourth son of Edward III., created Duke of Lancaster in 1362, was the founder of the rival house of Lancaster, or the "red rose"; and their claims were contested for nearly half a century in the so called Wars of the Roses. The first Duke of York was succeeded by his son EDWARD, who fell at Agincourt in 1415, and was succeeded by his nephew RICHARD, son of Anne Mortimer, who was grand-daughter of Lionel, Duke of Clarence, third son of Edward III. It was by virtue of this descent from the Duke of Clarence that the house alleged its superior right over that of Lancaster, which was descended from the fourth son of Edward III. The title was subsequently borne by Edward Plantagenet, afterward Edward IV.; by Richard Plantagenet, supposed to have been murdered in 1483 by his uncle Richard III.; by Henry Tudor, afterward Henry VIII.; by Charles Stuart, afterward Charles I.; by James Stuart, afterward James II.; and was conferred by the pretender, James III., on his second son Henry Benedict, known in history as Cardinal York, the last of the royal family of the Stuarts. After the accession of the house of Hanover to the British throne, George I. created his brother ELEANOR AUGUSTUS Duke of York and Albany (1716). He died in 1728, and the title was held by EDWARD AUGUSTUS, the second son of Frederick, prince of Wales, and FREDERIC, second son of George III., who was made commander-in-chief of the British army, but showed little ability. The title was in abeyance until 1892, when it was conferred on Prince George Frederick Ernest Albert.

York (British, *Caer Eborac*; Latin, *Eboracum*), England, an archiepiscopal city and civic county, capital of Yorkshire, 196 miles north-northwest from London by rail, at the confluence of the Foss with the Ouse. It consists of the city proper, and of suburbs, some portions of which are situated across the Foss, and communicate with the rest by several bridges. The city, with a circuit of nearly three miles, is enclosed by ancient double walls, originally Roman, but restored by Edward I., and partly repaired at subsequent periods; the portions which still remain have been converted into promenades, commanding a beautiful prospect of the surrounding country. York is entered by four imposing gates; and is built for the most part in narrow irregular streets, many lined with houses of antique appearance. Improvements have modernized many of the older parts of the city, and many handsome ranges of new buildings have been erected. The minister or cathedral dates from the 7th century, but did not begin to assume its present form till 1171, and was not completed till 1472. A square massive tower rises from the intersection to the height of 235 feet, and two other lofty towers of graceful proportion, 196 feet, flank a richly-decorated western front, divided by paneled buttresses into three compartments, of which that in the centre is chiefly occupied by a beautiful window and a splendid portal. Measured without the walls, the whole length, from east to west, is 524 feet, and the width across the

YORK

transepts, north to south, 222 feet; length, from west door to choir, 264 feet; length of choir, 162 feet; breadth of body and side aisles, 109 feet. The interior consists chiefly of a lofty nave, separated from its aisles by long ranges of finely clustered columns, a still loftier choir, lighted by a magnificent and beautifully blazoned window, and a lady-chapel continuing the choir, and containing some beautiful monuments. The cathedral has twice sustained serious damage and narrowly escaped total destruction from fire, caused in 1829 by an incendiary lunatic, and in 1840 by the negligence of a workman engaged on its repair. The chapter-house, entered from the north transept of the cathedral, is a richly decorated octagon, and near it is a fine old chapel, originally forming part of the old archiepiscopal palace, and now appropriated to the library. York possesses many other places of worship, including a beautiful Roman Catholic pro-cathedral; and collegiate, grammar, blue-coat, gray-coat, and board schools. Other notable buildings and establishments are an ancient Gothic guildhall (1446), and spacious mansion-house adjoining; the fine old ruins of St. Mary's Abbey; Clifford's Tower, part of the city castle founded by the Conqueror; the fine old merchants' hall; county assize courts; city courts of justice in the late Gothic style (1892); the museum of the Yorkshire Philosophical Society, assembly-room, masonic hall, baths, art-gallery, free library, the Yorkshire Club-house, concert rooms, two theatres, cemetery, lunatic and blind asylums, dispensary, county hospital, cattle market, almshouses, and numerous other charities. The railway station is one of the finest in the kingdom. The manufactures include iron castings, bottles, leather, flour, cocoa, and confectionery. York ranks second among English cities, its archbishop having the title of Primate of England (see *ARCHBISHOP*); its chief magistrate takes the title of lord-mayor. It is the headquarters of the North-Eastern Railway Company, and contains their carriage and wagon shops. There is communication by water with Selby, Goole, Hull, etc. York was the early British *Caer Eborac* of the Brigantes and under the Romans as *Eboracum* became their principal seat of power in the north, if not in the whole country. Here died the Roman emperors Severus and Constantius Chlorus, and here it is popularly (but incorrectly) supposed Constantine the Great was born. After their departure it so far retained its importance as to become the capital of Northumbria, whose king, Edwin, in 624 made it an archiepiscopal see. In the 8th century its diocesan school attracted students not only from all parts of the kingdom, but from France and Germany, and sent out scholars who afterward acquired European celebrity. Here the first English Parliament was held by Henry II. in 1160. In after-times it makes a distinguished figure in almost all the great epochs and events of English history, during the Civil War surrendering to the Parliamentarians after a siege of several weeks, subsequent to their victory at Marston Moor in the vicinity. Among its distinguished natives are Alcuin, the tutor to the family of Charlemagne; Flaxman the sculptor; and William Ety the painter.

York, Maine, town, port of entry, York County; on York River, and on the Boston &

Maine Railroad; about 45 miles south by west of Portland and 100 miles southwest of Augusta. It is in an agricultural region, but is known as a favorite summer resort. It has a number of buildings of historic interest, among which is the jail, which is one of the oldest in the country. It contains several villages in which are many summer cottages. The national bank in the village of York has a capital of \$50,000. The town was set off, in 1622, from land granted by the Plymouth Council to John Mason and Ferdinand Gorges. In 1624 the place was called *Agamenticus*. On 1 March 1640, a territory of 21 square miles was incorporated as a borough by Gorges, and chartered as the city of *Georgiana* in 1642. This was the first municipal corporation made by the English in North America. On the death of Charles I., in 1649, *Georgiana* City, Isle of Shoals, Wells, and Kitterytown united and established a confederacy. In 1652 the confederacy, and all of Maine came under the control of Massachusetts. The city charter of *Georgiana* was revoked, and the name changed to York. The limits of the present town are about as in 1652. In the early years the town suffered from Indian depredations; one attack, in 1692, resulted in the massacre or capture of about one half the inhabitants. The population is about 3,000. Consult: Emery, '*Ancient City of Georgiana and Modern Town of York*'; Baxter, '*Sir Ferdinand Gorges and His Province of Maine*' (1890).

York, Neb., city, county-seat of York County; on the Chicago, Burlington & Quincy, the Kansas City & Omaha, and the Fremont, Elkhorn & Missouri Valley R.R.'s; 50 miles west of Lincoln. It was settled in 1871 and in 1880 was incorporated. It is in an agricultural and stock-raising region, and its industries are connected chiefly with farm products. It has a flour mill, machine shop, foundry, large stock yards, and grain elevators. The educational institutions are York College (U. B.), opened in 1890; a high school, established in 1880; Holy Family Academy (R. C.); public and parish elementary schools and public and school libraries. The two national banks have a combined capital of \$150,000. Pop. (1910) 6,235.

York, Pa., city, county-seat of York County; on the Conodorus Creek, and on the Pennsylvania, the York Southern, the Northern Central, and the Western Maryland R.R.'s; about 28 miles southeast of Harrisburg, and 95 miles west of Philadelphia. It is in a productive farming section and has considerable manufacturing interests.

Industries.—In 1900 (government census) the city had 464 manufacturing establishments, capitalized for \$9,640,784. There were 404 officials and clerks whose salaries were \$438,281 per annum, and 7,785 wage-earners who received \$2,679,175 per annum. The total cost for material, rent, power, and heat, each year, was \$6,078,070, and the value of the finished products was \$11,661,706. The foundry and machine finished products amounted, each year, to \$2,654,772; and the tobacco products to \$1,190,155. Other manufactures of which there are large and valuable outputs annually are agricultural implements, cigar boxes, food products, carriages, wagons, carriage and wagon materi-

YORK—YORKE

als, confectionery, flour and grist mill products, furniture, iron and steel products (including nails, spike, wire nails, etc.), lumber products, paper and wood pulp, shirts, and patent medicines. The vast power generated at Yorkhaven, 11 miles north of York, will greatly increase the manufacturing industries of York. The York Haven Water and Power Company have built a crib dam to obtain a sufficient volume of water to run the large plant intended for the generation of electrical power and the distribution of this power to places in York and adjoining counties. There is an extensive trade in the manufactured products and in general merchandise which is distributed to the villages and towns of a large region.

Buildings and Municipal Improvements.—The surface is slightly rolling and has sufficient slope to make excellent drainage. The streets are broad and well shaded. The city is laid out in sections or blocks, 520 feet long and 480 feet wide. There are three small but beautiful parks: Highland, Farquhar, and Penn. The principal public buildings are the government building, the court-house, county jail, the Masonic Temple, four market buildings, an opera house, three public halls, and the municipal buildings. There is an excellent water-supply and a good sewerage system.

Churches, Charitable and Educational Institutions.—There are 60 churches, representing 16 different denominations. The principal charitable institutions and hospitals are the city hospital, charity hospital, county almshouse, Children's Home, and private sanatoriums. The educational institutions are York Collegiate Institute (Presb.), York County Academy, founded in 1787, two business schools, Saint Patrick's Academy (R. C.), a public high school, founded in 1870, public and parish schools, a public library, York County Law Library, and Saint John's Church free library.

Banks and Finances.—There are five national, three state, and two private banks. The combined capital of the banks is \$2,238,000; the annual amount of business is \$11,963,412. The municipal expenditures for annual maintenance and operation are about \$205,000. The chief items of expense are: for educational institutions, \$78,000; police department, \$21,000; municipal lighting, \$24,000; fire department, \$14,500; and street department, \$14,800.

Government.—The government is administered under a charter of 1887 which provides for a mayor, whose term of office is for three years, and a city council of 39 members, elected annually in February. The board of education is chosen by popular vote; the other administrative officials are appointed by the mayor subject to the approval of the council.

History.—A permanent settlement was made in 1735 by a German colony; but in 1741 the town was laid out by John, Thomas, and Richard Penn, and incorporated as a borough in 1787. In 1887 York was chartered as a city. In 1749, the first court of general quarter sessions was held here. In 1777 the Continental Congress left Philadelphia, fearing capture by Howe's army, and convened in York 30 September. Congress continued to hold sessions in York until 27 June 1778. Pop. (1880) 13,940; (1890) 20,793; (1900) 33,654; (1910 census) 44,730. Consult Gibson, 'History of York County.'

York, a river in Virginia, formed by the confluence of the Pamunkey and Mattaponi rivers. It is the tidal estuary of the rivers, which begins at West Point and flows southeast to the Chesapeake Bay. It is 40 miles long and navigable to the head of tide water. At its entrance, on York Spit, is a lighthouse.

York and Lancaster, Wars of. See ROSES, WARS OF THE.

York College, located at York, Neb. It was founded under the auspices of the United Brethren in Christ, and was opened to students in 1890. It is under the control of a board of trustees composed of five members at large and representatives of four conferences of the United Brethren. Its organization includes the College, the Preparatory Department, the Normal Department, the Conservatory of Music, the College of Commerce, the School of Shorthand, the School of Expression, the School of Art, the School of Telegraphy (organized in 1903), and the Summer School. The college offers classical, philosophical, scientific, and literary courses, and confers the degree of A.B. on the completion of the classical, philosophical, and literary courses, the degree of B.S. for the scientific course. The work of each course is very largely prescribed. The normal department offers a normal course of two years, and a three-years' teachers' course, which is preparatory to the normal course. The degree of bachelor of didactics is conferred on all graduates from the normal course. A model school was established in 1903. The conservatory of music offers courses in piano, voice, and violin, and confers the degree of bachelor of music for graduation from the full courses. The College of Commerce offers a course of one year, and an advanced course of two terms additional; the degree of bachelor of accounts is conferred on graduates from the advanced course. The Summer School courses are intended specially for teachers, and a model school is conducted. Instruction in physical training is given, and an organization of college cadets is maintained for military drill; there is also a field for athletic sports on the campus. The students maintain Young Men's and Young Women's Christian Associations, and two literary societies. The library in 1910 contained 2,500 volumes, the students numbered 479, and the faculty 16. York College is considered one of the leading institutions of higher learning in Nebraska.

York von Wartenburg, yörk fön vār'tēn-boorg, Hans David Ludwig, Count, a Prussian field-marshal: b. Potsdam 26 Sept. 1759; d. Klein-Öls, near Breslau, Silesia, 4 Oct. 1830. He entered the army in 1772, but was cashiered for insubordination in 1779, and then served the Dutch in the East Indies 1783-4. He, however, re-entered the Prussian service, becoming a major-general in 1807, and governor of the province of Prussia in 1811. He was especially distinguished during the War of Liberation and the invasion of France (1813-14), was ennobled in 1814, and made a field-marshal in 1821.

Yorke, yörk, Curtis, pseudonym of S. RICHMOND LEE, English novelist: b. Glasgow. She is the daughter of J. J. Long and was married to J. W. Richmond Lee, a mining engineer. Among her numerous works may be cited: 'That Little Girl' (1886); 'A Record of Disasters' (1894); 'Because of the Child' (1896);

VILLAGE STREET IN YORKTOWN.

'A Flirtation with Truth' (1897); 'A Memory Incarnate' (1902).

Yorkshire, England, the largest county of the kingdom, bounded on the north by the Tees, separating it from Durham, east by the North Sea, south by Lincoln, Nottingham, Derby, and Chester, and west by Chester, Lancaster, and Westmoreland; area, 6,067 square miles. Yorkshire is divided into three ridings, or three ridings, respectively the north, east, and west ridings, each riding having a separate lord-lieutenant. The main portion of the county forms a large central valley stretching southeast to the Humber, flanked on one side by the Pennine range and on the other by the Cleveland Hills, and drained chiefly by the Ouse and its tributaries. Considerably more of the North Riding is pasture than under cultivation, but it includes the vale of York, with an area of about 1,000 square miles, in which there is much fertile land growing all kinds of crops. It also includes the Cleveland district, with its great bed of iron ore. In the North Riding is the capital of the whole county, York; Scarborough, a favorite watering-place; and Whitby, famous for its jet. In the East Riding the area under cultivation greatly exceeds that laid down in permanent pasture. Its industrial activity is centred in the great seaport of Hull. In the West Riding the proportion of land laid down in permanent pasture is larger than in any other, being two thirds of that under cultivation. The West Riding has long been famous for its woollen and worsted manufactures, of which it is now the chief seat. Their development has been in modern times aided by the proximity of coal and iron. The great coal field of the West Riding yields not only the Silkstone bituminous coal, most valuable as a house coal, but also the Barnsley thick coal, semi-anthracitic. Leeds produces every variety of woollen goods; Bradford, mixed worsted fabrics and yarns; Dewsbury, Batley, and adjoining districts, shoddy; Huddersfield, plain goods, with fancy trouserings and coatings; and Halifax, worsted and carpets. Barnsley is famous for its linen manufactures, of which Leeds also is a seat, as well as of that of leather. Next to the woollen and other textile industries comes the manufacture of iron and steel machinery, and implements of every description. Leeds is one of the principal seats of all kinds of mechanical engineering, and Sheffield of iron-work and cutlery. Population of Yorkshire about 3,700,000.

Yorktown, Va., town, county-seat of York County; on the York River, seven miles from its mouth, and 68 miles southeast of Richmond. It has regular connection with the Chesapeake and Atlantic ports by means of the Old Dominion and other lines of steamers. York is one of the oldest settlements of the United States; it contains the oldest custom-house in the country. It is famous for having been the place where Lord Cornwallis surrendered, and a monument has been erected in honor of the event. In August 1781 Cornwallis, with a force of 8,000 men, took possession of the place, threw up earthworks and fortified the town. He was supported by several British vessels in the York River. Fortifications were erected also at Gloucester Point, opposite Yorktown. Washington left his headquarters on the Hudson on 19 August, and traveled by land to

Philadelphia, then to Elkton, at the head of Chesapeake Bay, and down the bay, arriving at Williamsburg 14 September. His force consisted of 7,000 French under Rochambeau and 9,000 Americans. On 29 September Washington and his men invested Yorktown. He was assisted by a French fleet under Count De Grasse, who blocked the river in such a way that the British were unable to send assistance to the soldiers at Yorktown. Clinton had sent reinforcements to Cornwallis, but De Grasse prevented the landing. The first parallel was established on 9 October, and the Americans opened fire and destroyed some of the British guns. The next day three large transports and a frigate were destroyed. The attack was renewed on the 11th and again on the 14th. On the 17th Cornwallis offered to capitulate, and on the 19th he surrendered. The American loss, including the French, was about 300 killed, wounded, and missing, and the British loss was about 550. This was the last important battle of the Revolutionary War.

Yorktown was the scene of a second siege during the Civil War (see **YORKTOWN, SIEGE OF**). Pop. (1910) 136.

Yorktown, Siege of, in the Civil War. On 4 April 1862 Gen. McClellan, with 58,000 men and about 100 guns, started from Fort Monroe up the York Peninsula for his campaign against Richmond. His plan of operation was to move in two columns, one on the right direct to Yorktown, and another along the James River westward of and beyond Yorktown to the vicinity of Williamsburg. Should the Confederate works at Yorktown and Williamsburg offer serious resistance he designed to land Gen. McDowell's First corps, reinforced if necessary, on the left bank of the York or on the Severn, and move it on Gloucester and West Point, in order to take in reverse whatever force the enemy might have on the peninsula and compel him to abandon his positions. At the end of the first day's march Gen. Heintzelman's Third corps on the right bivouacked at Howard's Bridge and Cockletown beyond, and Gen. Keyes' Fourth corps on the left, at Young's Mill, near James River. On the 5th Keyes resumed his march for the Halfway House, between Yorktown and Williamsburg, but had hardly got on the road when it was ascertained that a large force of the enemy, with a battery, was at Lee's Mills, six miles beyond, barring the way over the Warwick, which, according to the maps, should not have run in that direction. Keyes advanced, and in the afternoon found the situation as reported; and after some artillery-firing he encamped for the night. On the right Heintzelman advanced to near Yorktown, came under artillery-fire from the works, and encamped fronting them, where he was destined to remain a full month. Yorktown, as well as the line of the Warwick southward to James River, was held by Gen. J. B. Magruder, with about 11,000 men. For ten days McClellan remained in front of Magruder, making some reconnaissances, but no serious demonstrations. He was engaged in bringing up troops and guns preparatory to a regular siege, and was asking for heavy reinforcements and more heavy siege-guns. He was compelled to adopt the slow method of a siege from his exaggerated idea of the Confederate strength in his front and by

YORKTOWN—YOSEMITE VALLEY

the fact that McDowell's corps of 33,400 men, which he had proposed using to flank Yorktown, by Gloucester and West Point, had been withheld from him, to protect Washington (see *PENINSULA CAMPAIGN OF 1862*). On the 16th an attempt was made upon Magruder's lines at Lee's Mill (q.v.), but resulted in failure, and McClellan, giving up the idea of carrying the Confederate position by assault, devoted his attention entirely to siege operations against Yorktown. Under the direction of Gen. Fitz-John Porter, who was made director of the siege, Gen. J. G. Barnard, chief of engineers, and Gen. W. F. Barry, chief of artillery, the operations were conducted elaborately and with great skill. Gen. Barry reports that the siege train consisted of 101 pieces, as follows: "Two 200-pounder Parrott rifled guns, eleven 100-pounder Parrott rifled guns, thirteen 30-pounder Parrott rifled guns, twenty-two 20-pounder Parrott rifled guns, ten 4½-inch rifled siege guns, ten 13-inch sea-coast mortars, ten 10-inch sea-coast mortars, fifteen 10-inch siege mortars, five 8-inch siege mortars, and three 8-inch siege howitzers. Three field batteries of 12-pounders were likewise made use of as guns of position." These guns were mounted on very elaborate works, some 15 in number, established opposite the town and the works to its right, at ranges varying from 1,500 to 2,200 yards. In number and weight of metal they were far superior to those of the Confederates. On the 17th Gen. J. E. Johnston had been assigned to the defense of the peninsula and Richmond, and he had on the Yorktown and Warwick line not to exceed 50,000 men. He made no strenuous effort to interfere with McClellan's operations, but determined to hold his position until McClellan was ready to attack and then to fall back without waiting to have his troops driven from their works. By 30 April McClellan had present for duty 115,102 men, including Franklin's division that had been sent to him to turn Yorktown by Gloucester Point or West Point, but which since its arrival on the 20th had been kept on board transports. On 1 May McClellan proposed to open fire on the morning of the 6th with all his guns, and to press the siege until final assault should be deemed practicable. But on 27 April Johnston had learned that McClellan's batteries were approaching completion and would be ready to open fire in five or six days, and he made his dispositions for retreat. On the night of 3 May, leaving some serviceable heavy guns behind, he evacuated Yorktown and fell back to Williamsburg on the way to Richmond.

Consult: 'Official Records,' Vol. XI.; 'McClellan's Own Story'; Webb, 'The Peninsula'; Barnard, 'Peninsular Campaign'; Allan, 'History of the Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. CARMAN.

Yorktown, Siege of. In the war of the American Revolution, Lord Cornwallis and the British army reached Virginia in May 1781, and in the following August invested Yorktown, on the York River. Washington and his army advanced on the enemy by land, and the French fleet of Count de Grasse, numbering 28 ships of the line, with nearly 4,000 infantry on board, reached the Chesapeake and came to safe anchor in the mouth of York River. Cornwallis was

securely blockaded both by sea and land. Just after the arrival of Count de Grasse came also Count de Barras, who commanded the French flotilla at Newport. He brought with him into the Chesapeake 8 additional ships of the line and 10 transports; also cannon for the siege of Yorktown. By the beginning of September York River was effectually closed at the mouth and the Americans and the French began to strengthen their lines by land. On 5 September the English Admiral Graves appeared in the bay with his squadron, and a naval battle ensued, in which the British ships were so roughly handled that they were glad to draw off and return to New York. On 28 September the allied armies, now greatly superior in numbers to the enemy, and confident of success, encamped closely around Yorktown, and the siege was regularly begun. By 6 October the trenches had been contracted to a distance of only 600 yards from the British works. From this position the cannonade became constant and effective. On the 13th, in the night, the Americans made an assault, and the outer works of the British were carried by storm. At day-dawn on the 16th the British made a sortie from their intrenchments, but were wholly unsuccessful. On the 17th Cornwallis proposed to surrender, and on the 19th Major-General O'Hara led out the whole British army from the trenches into the open field, where, in the presence of the allied ranks of France and America, 7,247 English and Hessian soldiers laid down their arms, delivered their standards, and became prisoners of war.

Yorkville, S. C., town, county-seat of York County; on the South Carolina & Georgia extension and the Southern R.R.'s; about 85 miles north of Columbia. It is in an agricultural region, in which are valuable deposits of iron. It has iron works, machine shops, saddle and harness factory, spoke and handle works, and lumber mill. There are seven churches and two graded schools (including high school departments), one for colored and one for white pupils. The savings bank has a capital of \$50,000. Pop. (1910) 2,326.

Yoruba, yó'róo-bá, or Yarriba, yá'rè-bá, northern Nigeria, West Africa, a former independent state situated north and northeast of the colony of Lagos, peopled by a number of confederated tribes, and now attached to the colony and protectorate of Lagos. Much of the country is fertile and well cultivated, and the inhabitants have made great progress in the industrial arts. They are largely pagans, but Mohammedanism and Christianity have made way among them. Protestant and Roman Catholic missions have long been at work. Ibadan, to which there is a railway from Lagos, is the largest town, having about 200,000 inhabitants; Oyo, farther to the north, is the capital.

Yosemite, yó-sém'i-té (Indian, "full-grown grizzly bear") Valley, in Mariposa County, Cal., on the west slope of the Sierra Nevada; about 150 miles, in direct line, east by south of San Francisco. This valley is one of the natural curiosities of America, and is unlike any other known valley in the world. It is about six miles long and from half a mile to a mile wide. It is nearly a mile below the general level of the land near it. Entering the valley from the lower end, the two distinct valley

types may be seen, the V-shaped and the U-shaped (see VALLEYS). It has the characteristics of a gorge and also of a cañon. It is nearly enclosed by walls of granite from 3,000 to nearly 5,000 feet in height. On the north side is a huge block of granite called El Capitan. It projects into the valley so that two of its smooth, almost perpendicular faces are visible; the height is 3,300 feet. Opposite El Capitan are Cathedral Rocks and Bridal Veil Rock. From the summit of El Capitan to the summit of Bridal Veil Rock is one mile; but at the base of the rocks the distance apart is not great. The bottom of the valley widens from El Capitan up to the "meadows." Other conspicuous blocks of the unbroken wall are called the Three Brothers (4,000 feet), the Spires, Cap of Liberty, and Sentinel Rock.

About 15 miles above is the source of the Merced River, which flows through the Yosemite Valley. The Illouette River which enters the valley from the south, and the Tenaya Fork, from the northeast, are branches of the Merced. There are two falls and about half a mile of rapids in the Merced River, beginning just below the point where the stream enters the valley. Nevada Fall, the upper one, is about 600 feet high, and Vernal Fall is about 400 feet. The Bridal Veil Falls is on the side of Cathedral Rock which faces the entrance. Bridal Veil Creek here falls over a precipice 630 feet high, and flows over an irregular bed which forms a series of cascades that combined make a descent of about 300 feet. The total fall is 900 feet. The name comes from the appearance of the highest vertical sheet of water at times when the amount of water in the stream is not too great and when the wind sways the "veil of waters." Just below El Capitan is a fall called Virgin's Tears, which is over 1,000 feet high. The waters flow over this precipice only for a few months after the summer heat has melted the mountain snows. The Yosemite Falls, nearly opposite Sentinel Rock, is made by the Yosemite Creek. The first vertical fall is 1,500 feet; then the water descends, in a series of cascades about 625 feet, and again flows over a precipice 400 feet high. In the "meadows" are a variety of flowers and grasses in the early summer months. The principal trees are the pine, fir, cedar, and oak.

In the vicinity are many features of interest; great masses of dome-shaped rocks, and the famous "big trees" of California are nearby. Among the prominent elevations are North Dome, Sentinel Dome, Half Dome, and Glacier Point. From Sentinel Dome may be obtained a good view of the Yosemite Valley and the surrounding country. Glacier Point (4,740 feet) also affords a magnificent view. Half Dome is an imposing mass, 4,700 feet high.

The Yosemite Valley was discovered in 1851 by settlers who were located near a mining camp in the vicinity. The Indians had been annoying the white settlers and miners, and while in pursuit of the band of red men, the whites found this valley. It was named after an Indian chief. In 1864, Congress gave the Yosemite Valley to the State of California, to be "held for public use, resort, and recreation," and to be "inalienable for all time." It is under the control of commissioners who are appointed by the governor. Private parties have built wagon-roads to the valley, and trails to various

points of interest in the vicinity. In 1886 a railroad, 22 miles long, was built from Berenda, the Central Pacific Railroad, to Raymond, whence a stage line extends to the valley. In the grant to the State, in 1864, besides the valley proper there was included adjacent territory for two miles around it. Since 1890 the whole grant has been called Yosemite National Park.

Consult: Bunnell, 'Discovery of the Yosemite'; 'Guide to the Yosemite' (California Geological Survey).

Yō'abihito, Emperor of Japan: b. 31 Aug. 1879. He acceded to the throne of Japan, as Mikado, on the death of his father Mutsuhito, 30 July 1912, going through the ceremony of "Receiving the Sacred Treasures." He has received a thorough education at the Peers' School in all the learning of modern Japan, as well as in the arts and sciences of the Occident, and is broad, liberal and democratic.

You'atte, William, English veterinary surgeon: b. Exeter, Devonshire, 1777; d. London 9 Jan. 1847. Having been educated for the ministry, he preached for a few years in London, but about 1813 established there a veterinary infirmary, lecturing on veterinary practice 1828-35. He published 'The Complete Grazier' (American ed. 1864); 'Extent and Obligation of Humanity to Brutes'; 'Treatise on Cattle' (1834); 'Treatise on Sheep' (1837); 'Treatise on the Horse' (1831); 'Treatise on the Pig' (1847); and 'Treatise on the Dog' (1842); and was the owner and editor of 'The Veterinarian,' established in London in 1828, the first periodical devoted to that class of subjects.

Youghal, yā'hal or yāl, Ireland, a seaport of County Cork, on the estuary of the Blackwater, 27 miles east of Cork. The parish church is formed of the nave and aisles of the ancient collegiate church, built by the Earl of Desmond in 1464; the "water gate," the "clock gate," and Sir Walter Raleigh's house, Myrtle Grove, are other notable features. The export of agricultural produce and the fisheries are the chief industries. According to local tradition, the potato was first planted at Youghal by Raleigh, who was mayor in 1588. Pop. about 7,000.

Youmans, yoo'manz, Edward Livingston, American scientist: b. Coeymans, N. Y., 3 June 1821, d. New York 18 Jan. 1887. Partially blind at times through many years of his life, he pursued his studies by the aid of his sister, Eliza Ann Youmans, and became widely known as a popularizer of science. He lectured extensively and in 1872 founded 'The Popular Science Monthly,' which he edited till his death and established the 'International Scientific Series.' The volumes of this series were published simultaneously in different languages in London, Paris, New York, Leipzig, Saint Petersburg, and Milan. He also published several other books on popular subjects.

Youmans, William Jay, American chemist, brother of E. L. Youmans (q.v.): b. Milton, Saratoga County, N. Y., 14 Oct. 1838; d. Mount Vernon, N. Y., 10 April 1901. He studied chemistry at Columbia College and at the Sheffield Scientific School, New Haven, and was graduated from the medical department of the New York University in 1865 and practised his profession for a time at Winona, Minn. In 1871 he was called to assist his brother, who had

YOUNG

planned to publish 'The Popular Science Monthly,' and from that time till 1900 was actively connected with the management and editorship of that periodical. He edited 'Pioneers of Science in America' (1895); Huxley's 'Lessons in Elementary Physiology,' adding a second part, 'Elementary Hygiene' (1867).

Young, Alexander, American Unitarian clergyman: b. Boston 1800; d. there 15 March 1854. He was graduated at Harvard in 1820, studied theology at Cambridge, and in 1825 became pastor of the New South Congregational Church in Boston, which office he held till the close of his life. He published 'Chronicles of the Pilgrim Fathers of the Colony of Plymouth' (1841); 'Chronicles of the First Planters of the Colony of Massachusetts Bay' (1846); 'Library of Old English Prose Writers' (9 vols., 1831-4); etc.

Young, Andrew White, American political economist: b. Carlisle, N. Y., 2 March 1802; d. Warsaw, N. Y., 17 Feb. 1877. His publications include: 'Introduction to the Science of Government' (1835); 'First Lessons in Civil Government' (1843); 'Citizen's Manual of Government and Law' (1851); 'The American Statesman: A Political History of the United States' (1855); 'National Economy: A History of the American Protective System' (1860).

Young, Arthur, English agricultural writer: b. London 11 Sept. 1741; d. there 20 April 1820. He was intended for a mercantile career, but early adopted the profession of agriculture, carrying on farms at various places, and especially on his paternal estate, near Bury St. Edmunds. He soon became famous as a writer on farming and allied topics, and especially for his agricultural tours. He also carried on an extensive correspondence with public men both at home and abroad, Washington being one of his correspondents. In 1784 he began the publication of his 'Annals of Agriculture,' of which 46 volumes were issued. This work had the most important influence upon the art of agriculture in England, and a considerable portion of it was translated into French under the auspices of the government. In 1793 he was appointed secretary of the newly erected board of agriculture, with a salary of £400 a year. Young not only visited and examined with great attention many parts of England and Ireland, but also made several tours on the Continent. He became blind some years before his death. Among his numerous works are: 'The Farmer's Letters to the People of England' (1767, enlarged edition 1777); 'Six Weeks' Tour through the Southern Counties' (1768); 'Six Months' Tour through the North of England' (1770); 'Farmer's Guide' (1770); 'Farmer's Tour through the East of England' (1771); 'The Farmer's Calendar' (1771); 'Tour in Ireland' (1780); 'Travels in France during the Years 1787-89' (1792-4); treating of agriculture and national resources, the social and political condition of the people, the most reliable source of information regarding the state of France on the eve of the Revolution; 'Essays on Manures' (1804); 'The Rise of Prices in Europe' (1815). By order of the French Directory his agricultural works were published in French in 20 volumes entitled 'Le Cultivateur Anglais' (1800-1). Consult. Les-

lie Stephen, 'Studies of a Biographer' (1898); his Autobiography edited by Miss Betham Edwards (1898); and bibliography by Anderson in Hutton's edition of 'Tour in Ireland' (1892).

Young, Brigham, American Mormon leader: b. Whitingham, Vt., 1 June 1801; d. Salt Lake City 29 Aug. 1877. He learned the trade of painter and glazier and worked at this occupation in Mendon, N. Y. Early in life he joined the Baptists, but in 1831 was converted to Mormonism, and joined the sect at Kirtland, Ohio, in 1832. In 1835 he was ordained an elder and sent forth as one of the 12 apostles, the New England States being the district assigned him. On the death of Joseph Smith, in 1844, he was unanimously chosen president and prophet, though he had three competitors for the office, one of whom, Sidney Rigdon, he soon afterward excommunicated. On the forcible expulsion of the sect from Nauvoo, Ill., in 1846, Young led them through toils and dangers, which nothing but the most untiring energy could have conquered, over the plains and tablelands to the valley in the heart of the Rocky Mountains, where, between the Wasatches and the Great Salt Lake, he founded in July 1847 the present Salt Lake City. His immediate followers forming a nucleus, others poured into "the Promised Land," and in 1849 an attempt was made to organize a State, to be called the State of Deseret, that being the official name given by the Mormons to the district. The United States government refused to sanction the new State, but Utah was organized as a territory, and Young appointed governor by President Fillmore. The appointment of a "Gentile" governor in 1854 led to serious troubles as Young and the other Mormons refused to recognize his authority, and it was not till a force of 2,500 troops was sent out in 1857 that the United States government could enforce its authority.

Young was the founder of polygamy as an institution, and among the first to practise it. In 1852 he promulgated the "celestial law of marriage," which he declared to have been revealed to Joseph Smith nine years before. A large party, among whom were Smith's wife and sons, in the Church opposed the innovation, and declared the revelation to be a forgery, but Young's influence carried the day. He himself had from 15 to 18 actual wives, besides numerous spiritual wives who were formally "sealed" to him. He was twice indicted for polygamy, but each time the case fell through. His 19th wife, Ann Eliza Young, sued for a divorce in 1875. The Mountain Meadow Massacre of 1857 was brought to the notice of the law in 1875. In it a company of 136 emigrants, which had come into collision with the Mormon settlers, was practically exterminated, only a few children being allowed to escape. The court exonerated Young from complicity in the affair, but Bishop Lee, a leading Mormon, was condemned to death in 1876, and shot in March 1877 on the scene of the massacre. See *Mormons*.

Young, Charles Augustus, American astronomer: b. Hanover, N. H., 15 Dec. 1834. He was graduated at Dartmouth in 1853, was professor of mathematics, physics, and astronomy in Western Reserve College (1857-66); and of astronomy and physics in Dartmouth (1866-77).

YOUNG

He was professor of astronomy at Princeton 1877-1906. He accompanied the eclipse parties to Iowa in 1869, and to Spain in 1870; the transit of Venus party to Peking, China, 1874, and organized the Princeton eclipse expedition to Denver in 1878. He was the discoverer of the green line of the solar corona in 1869, identifying it with the line 1,474 of Kirchhoff's scale. At the 1870 eclipse he detected the so-called "reversing layer" surrounding the solar photosphere, and in 1872 at Sherman, Wyo., noticed the bright reversal of many lines of the solar spectrum in ordinary sunlight. He was recognized as an authority in spectroscopy and lectured in the courses of the Peabody Institute at Baltimore, the Lowell Institute at Boston, and at many colleges. He wrote 'The Sun' (1882); 'General Astronomy' (1889); 'Elements of Astronomy' (1890); 'Lessons in Astronomy' (1891); 'Manual of Astronomy' (1902). He died 4 Jan. 1908.

Young, Charles Mayne, English tragedian: b. London 10 Jan. 1777; d. Southwick, Sussex, 28 June 1856. In 1798 he made his debut at Liverpool as Young Norval, and his first appearance in London, in 1807, was as Hamlet. As Hamlet, Iago and Falstaff he was seen at his best, but his repertoire was very extensive. In 1829 he declined an offer of \$50,000 for a ten months' tour in the United States, and in 1832 retired with a fortune of \$300,000. At his farewell benefit at Covent Garden, 31 May 1852, he appeared as Hamlet, with Mathews as Polonius, and Macready as the Ghost. Consult J. C. Young, 'Memoirs of Charles Mayne Young' (1871).

Young, Clark Montgomery, American educator: b. Hiram, Ohio. He was graduated at Hiram College, and since 1833 has been employed in educational work in South Dakota. He was secretary of the Territorial board of education of Dakota in 1889, and of the State board of education of South Dakota, and since 1892 has been professor of history and sociology in the University of South Dakota. He has published 'The State and Nation' (with G. M. Smith); 'History and Government of South Dakota'; 'Elements of Pedagogy'; etc.

Young, Edward, English poet: b. Upham, Hampshire, 3 July 1683; d. Welwyn, Hertfordshire, 5 April 1765. He was educated at Oxford and in 1708 was nominated to a law fellowship in All Souls College. Befriended by the Duke of Wharton, an annuity of £100 was granted him by the duke. In 1719 and 1821, respectively, appeared his tragedies of 'Busiris' and 'Revenge,' both produced at Drury Lane. In 1725 he began the publication of a series of satires, 'The Universal Passion.' He now took holy orders, and in 1728 was nominated one of the royal chaplains. In 1730 the College of All Souls presented him with the rectory of Welwyn, in Hertfordshire, to which the lordship of the manor was attached. In 1731 he married Lady Elizabeth Lee, daughter of the Earl of Lichfield, and after his marriage the poet lived much in retirement at Welwyn, sadly disappointed that church preferment, which he so eagerly desired and so unscrupulously belauded those in power to obtain, was refused him. The work by which he is best known is 'The Complaint, or Night Thoughts on Life, Death, and Immortality' (1742-5), a series of argumenta-

tive poems in blank verse, intended to prove the immortality of the soul and the truth of the Christian religion—a work displaying great force of pious and somewhat gloomy reflection, and containing many lofty passages, but marred by a straining after antithesis and ornament. The 'Night Thoughts' were translated into French and German, and were as popular on the Continent as at home. Of Young's three tragedies, 'Busiris' (1719); 'The Revenge' (1721); and 'The Brothers' (1753), only the second has kept a place on the stage. His 'Night Thoughts' has never since ceased to be popular, and many of its sententious lines have become proverbial. The poem is not destitute of real excellence, but a note of insincerity runs through it and the poet too often substitutes pomposity for dignity. Consult Mitford edition of Young's 'Poetical Works' with 'Life' (1854); Thomas, 'Le poète Edward Young' (1901); 'Worldliness and Other-Worldliness,' by George Eliot, in 'Westminster Review' for 1857, reprinted in her 'Essays and Leaves from a Notebook' (1884).

Young, Franklin Knowles, American author and inventor: b. Boston, Mass., 21 Oct. 1857. He is the inventor of an automatic breech action for small arms and field artillery and has published 'The Minor Tactics of Chess'; 'The Major Tactics of Chess'; 'Chess Strategics'; 'Napoleon's Campaigns.'

Young, Sir Frederick, English publicist: b. London 21 June 1817. He was formerly a London merchant and has for many years busied himself in endeavors to promote the general welfare, aiding in securing Victoria Park, London, and Epping Forest to the public, and in establishing the People's Palace. He took great interest in emigration and was one of the earliest advocates of imperial federation. He published: 'Long Ago and Now' (1863); 'New Zealand: Past, Present, and Future'; 'A Winter Tour in South Africa' (1890); 'A Scheme for Imperial Federation' (1895); 'Exit Party' (1900); 'A Pioneer of Imperial Federation in Canada' (1902); etc., and edited 'Imperial Federation' (1876).

Young, Frederick George, American educator: b. Burnett, Wis., 3 June 1858. He was graduated at Johns Hopkins University in 1886; was vice-principal of the State Normal School, in Madison, S. Dak., 1887-90; principal of the Portland High School, Ore., 1890-4; president of Albany College, Ore., 1894-5; and was appointed professor of economics and history in the University of Oregon in the year last named. He edited 'Sources of the History of Oregon,' and is editor of the 'Quarterly Journal of the Oregon Historical Society.'

Young, James, Scottish chemist: b. Glasgow 14 July 1811; d. 13 May 1883. He began his career as a cabinetmaker, but in the evenings studied chemistry under Professor Graham in Anderson's College, Glasgow, and became his assistant both there and afterward at University College, London (1832-8). Receiving appointments in chemical works at Manchester and elsewhere, he discovered a method of distilling oil from bituminous shale, and thus became the founder of the mineral-oil industry of Scotland, besides leading to the development of the petroleum industry in America and elsewhere. (See PARAFFIN.) He acquired a large

YOUNG

fortune and endowed a chair of chemistry in Anderson's College, and fitted out at his own expense an expedition in search of Livingstone, in 1872.

Young, James Thomas, American publicist: b. Philadelphia, Pa., 23 Sept. 1873. He was graduated at the University of Pennsylvania in 1893; and became instructor there in 1896. He has published 'Der Staatsdienst in Deutschland, der Schweiz und den Vereinigten Staaten' (1896), and 'Administrative Centralization in France,' and 'Administrative Centralization in England' in the 'Annals' of the American Academy of Political and Social Science.

Young, Jesse Bowman, American Methodist clergyman and author: b. Berwick, Pa., 5 July 1844. He was graduated at Dickinson College in 1868, but had previously served three years in the Union army during the Civil War, becoming captain in the 84th Pennsylvania volunteers. Entering the ministry in 1868, he held pastorates in Pennsylvania and Kansas City, Mo., and was subsequently editor of the 'Central Christian Advocate' (1892-1900); etc. He has published 'What a Boy Saw in the Army'; 'Days and Nights on the Sea'; 'Helps for the Quiet Home' (1900); 'Our Lord and Master' (1903).

Young, Sir John, BARON LISGAR, English statesman: b. Bombay, India, 31 Aug. 1807; d. Ireland 6 Oct. 1876. He was graduated at Oxford in 1829, called to the bar in 1834, and sat in the House of Commons in 1831-45. He was lord of the treasury 1841-4; secretary of the treasury in 1844-6; chief secretary for Ireland in 1852-5; and lord high commissioner of the Ionian Islands 1855-9. He succeeded to the baronetcy on the death of his father in 1848 and from 1860 to 1867 was governor to New South Wales. Appointed governor-general of Canada in 1868 he filled this post till 1872, when he was succeeded by the Earl of Dufferin. During his Canadian governorship he suppressed the Riel rebellion in 1870 and was rewarded with the title of Baron Lisgar.

Young, John Russell, American journalist: b. Downingtown, Pa., 20 Nov. 1841; d. Washington, D. C., 17 Jan. 1899. In 1857 he was copyholder on the Philadelphia Press; and later its news editor. At the outbreak of the Civil War he became war correspondent, and was with the Army of the Potomac from the battle of Bull Run to the end of the Chickahominy campaign, when he returned to Philadelphia and became managing editor of the Press. In 1865 he joined the editorial staff of the New York Tribune, retiring in 1869; established the *Morning Post* in Philadelphia; and the *Standard* in New York (1869); and was European correspondent of the New York Herald (1871-7). As correspondent of that paper he accompanied General Grant in his journey round the world in 1877, and was attached to the editorial staff of the Herald 1879-82. He was minister to China 1882-5; and was appointed librarian of Congress 30 June 1897. He published 'Around the World with General Grant' (1879); 'Memorial History of Philadelphia,' edited 1895.

Young, Julia Evelyn Ditto, American verse writer and novelist: b. Buffalo, N. Y., 4 Dec. 1857. She has published 'Adrift: A Story of Niagara' (1880); 'Glynn's Wife: A Story

in Verse' (1896); 'Thistle-Down,' poems; 'The Story of Savilla' (1897), verse; etc.

Young, Robert, Scottish Biblical scholar: b. Edinburgh 10 Sept. 1822; d. there 14 Oct. 1889. He became a printer and superintended the Mission Press at Surat, India (1856-61). He subsequently devoted himself to preparing, printing, and publishing at Edinburgh a long series of works of somewhat narrow but remarkable Biblical scholarship; among them were an independent translation of the Bible; 'Marginal Readings (10,000) for the English Testament'; 'Concise Critical Comments on the Holy Bible'; 'Grammatical Analysis' of the Hebrew, Chaldee, and Greek Scriptures (1885); 'Hebrew Vocabulary'; and a laborious 'Analytical Concordance to the Bible,' giving 311,000 references (1880).

Young, Robert Anderson, American Methodist clergyman: b. Knox County, Tenn., 23 Jan. 1824; d. 1902. He was graduated at Washington College, Tenn., in 1844; entered the Methodist ministry, and held pastorates in several cities in Tennessee. He was president of the Wesleyan University, Florence, Ala., 1861-4; financial secretary of the board of trustees of Vanderbilt University, 1874-83; secretary of the board of missions of the Methodist Episcopal Church, South; and secretary of the Tennessee Conference for 21 years. He was editor of the 'Advocate of Missions,' and author of 'Personages'; 'Ariel'; 'Twenty Thousand Miles'; 'Celebrities, and Less'; etc.

Young, Samuel Baldwin Marks, American general: b. Pittsburg, Pa., 9 Jan. 1840. He entered the Union army as a private in 1861; served with distinction through the Civil War; and was brevetted brigadier-general in 1865. Joining the regular army as 2d lieutenant in May 1866, he became colonel in 1897; was commissioned brigadier-general of volunteers the next year, and participated in the Cuban campaign. He was promoted major-general of volunteers; served in the Philippines in 1899-1901; was promoted major-general U. S. A. 2 Feb. 1901; and served as military governor of northwestern Luzon and was commander of the 1st District, Department of Luzon. In February 1902 he was elected as the first president of the newly established Army War College, in Washington, D. C.

Young, Samuel Hall, American Presbyterian clergyman: b. Butler, Pa., 12 Sept. 1847. He was graduated at the University of Wooster, Ohio, in 1875, and at the Western Theological Seminary, Allegheny, Pa., in 1878; and ordained to the Presbyterian ministry in 1878. Going to Fort Wrangel, Alaska, as a missionary and explorer in 1878, he organized the first Protestant church in Alaska in 1879; and afterward held pastorates in California, Illinois, Iowa, and Ohio. Sent to the Klondike in 1897, he established the First Presbyterian Church in Dawson in 1898; and organized missions in Eagle, Romfort, Nome, and Teller. In 1901 he was appointed superintendent of all the Presbyterian missions in Alaska.

Young, Thomas, English physicist and archaeologist: b. Milverton, Somerset, 13 June 1773; d. London 10 May 1829. He was of Quaker parentage and was brought up in the strict discipline of that sect, studied medicine and received his degree at Cambridge. As early

YOUNG—YOUNG MEN'S CHRISTIAN ASSOCIATION

as 1799 Young wrote his celebrated memoir on the 'Outlines and Experiments respecting Sound and Light,' which speedily conducted him to the discovery and demonstration of the interference of light. This discovery alone, according to Sir J. Herschel, would have sufficed to have placed its author in the highest rank of scientific immortality. In 1801 he became professor of natural philosophy at the Royal Institution, and in 1802 foreign secretary to the Royal Society—an office which he held for the remainder of his life. The series of lectures delivered in connection with his professorship form the substance of his great work, 'Natural Philosophy and the Mechanical Arts' (1807). In 1811 he was elected physician to St. George's Hospital. In 1818 he was appointed secretary to the board of longitude, with the charge of superintending the 'Nautical Almanac.' In addition to the works already named, and many scientific papers, he published 'An Account of Some Recent Discoveries in Hieroglyphical Literature and Egyptian Antiquities' (1823). Consult Peacock, 'Life of Young,' and 'Miscellaneous Works,' edited by Peacock and Leitch (1855).

Young, William, American poet and dramatist: b. Illinois 1847. He has published 'Wishmakers Town,' poems (1885-98); and the plays: 'Jonquil'; 'The Rogue's March' (1872); 'Pendragon,' verse (1881); 'The Rajah' (1883); 'Ganelon,' verse (1888); 'The Home of Mauprat,' with J. G. Wilson (1882); 'Ben Hur,' dramatization (1899); 'Woman's Wiles' (1898); 'The Sprightly Romance of Mersac' (1900); etc.

Young England, a political party formed in London about 1844 by Mr. Disraeli, after he had begun to oppose the general policy of Sir Robert Peel. Besides its founder it contained some young men of ability and position, prominent among them being Lord John Manners, now Duke of Rutland; George Smythe, afterward Viscount Strangford; and Baillie-Cochrane, afterward Lord Lamington. Its programme was the reconciliation of the aristocracy and the Church on the one hand, and the people on the other. Its principles were attractively expounded in Disraeli's two fictions, 'Coningsby' and 'Sybil.'

Young Germany, a group of literary and political innovators in Germany, headed by Heine (q.v.).

Young Ireland, the name applied to a company of Irish agitators, who were active between 1840 and 1850. They at first adhered to O'Connell, but soon became very radical in their opinions and separated from the conservative Irish politicians in 1844. 'The Nation' was their political organ and in this journal the Irish people were constantly incited to revolt. In 1848 John Mitchell (q.v.), one of the leaders of the party, was arrested and sent to Tasmania, and the attempted insurrection which followed soon collapsed, two of the leaders, T. F. Meagher (q.v.), and W. S. O'Brien (q.v.), being sentenced to death, but their sentences were presently commuted to transportation.

Young Italy, a society of Italian republicans formed by Giuseppe Mazzini (q.v.) in 1831, whose aims were the emancipation of the

Italian peninsula from the control of Austria, and the union of the various portions of the country under a republican rule. Its greatest activity was in 1834, when Mazzini led an unsuccessful invasion of Savoy. The influence of the society soon declined, but it was of service in arousing Italian patriotism and it formed the model for similar organizations elsewhere in Europe, such as Young France, Young Germany, etc.

Young Men's Christian Association. A Young Men's Christian Association is an organization composed of young men who are united together for the purpose of ministering to the spiritual, intellectual, social, and physical needs of young men. Any young man of good moral character, regardless of race or creed, may become a member of this organization and enjoy its privileges; but only active members, who must be in communion with a Protestant evangelical church, can vote or hold office. Local associations are usually under the administration of a board of directors, which employs to carry on its work officers known as general secretaries, physical directors, boys' secretaries, etc. Local societies are independent and autonomous in their administration. Local societies are affiliated together into national, and sometimes into international, unions. These national unions are under the administration of a national committee. The national organizations are further united into a world's organization, having its headquarters at Geneva, Switzerland. The world's organization is administered by what is known as the Central International Committee of Young Men's Christian Associations, 3 Rue Général Dufour.

History.—The establishment of the Young Men's Christian Association was occasioned by the growth of the modern city. The city movement which has spread throughout the more industrial parts of the world created an environment which made necessary special effort in behalf of young men. Without the rise of the city, the parlors, gymnasiums, reading-rooms, educational classes, Bible studies, religious meetings, this vast organization of over 700,000 young men, with its secretaries, directors, committees, costly buildings, and mighty influence would never have been born.

The Association movement was founded by a young man who came from the country to the city. It was founded primarily for commercial young men living away from home in cities. Without the spread of the city it would have remained a London institution, and never have become a world-wide organization. The city has become the dominant factor in modern life. Young men form the largest and most important element of the large army which is annually invading the city from the country. The proportion of young men in the city is much larger than in rural districts. In the city, the home and the Church have a smaller place in the life of the average young man than in the country. The city is full of opportunities to gratify temptation. Contrasted with the country, where life is in the open air and activity is chiefly muscular, life in the city is indoors, and far more full of nervous excitement. It should also be said that the city has brought young men together in large numbers, and so made possible

YOUNG MEN'S CHRISTIAN ASSOCIATION

an organization among themselves in their own behalf.

The history of the Association falls into three periods: 1844 to 1855, the founding of the Association; 1855 to 1878, the development of Association methods; 1878 to the present time, the wide extension of the movement.

Period I, 1844 to 1855. Founding of the Young Men's Christian Association.—The founder of the Young Men's Christian Association, George Williams, now Sir George Williams, who was born at Ashbury Farmhouse, near Dulverton, southern England, in 1821, grew into manhood at the time when the industrial revolution in England was attracting young men from the country to the town. He went to London in October 1841, and became a clerk in the dry goods establishment facing St. Paul's churchyard, of which he is now the proprietor. At that time there were some 80 young men employed in the different departments of the business. Through Mr. Williams' efforts, a Young Men's Christian Association was organized, for the purpose of establishing religious services and Bible classes among the young men employed in various houses of business in London. This organization took effect on 6 June 1844. The name was suggested by Christopher Smith, George Williams' room-mate. The constitution provided that the Association should seek to promote the spiritual and mental improvement of young men engaged in the drapery trade, that its membership should be young men who gave decided evidence of conversion to God, and that its management should be in the hands of a small board chosen from the membership. This movement rapidly assumed important proportions. Prayer meetings and Bible classes were soon established in 14 different business houses, and a missionary to young men was employed in January 1845. In 1848, apartments were rented, in which a library, reading-room, restaurant, social parlors, and educational classes were provided; and young men who made no religious profession were invited, upon the payment of a small fee, to use the privileges of the institution, though they were given no share in its management and were known not as members but associates. A lecture course was established, which soon became the most important lecture platform in London. Branches of the parent society sprang up in different parts of the metropolis, and provincial branches in different parts of the United Kingdom became affiliated with the parent society.

The Association was marked by intense religious zeal. Through personal interviews by its members with young men, through Bible classes and evangelistic meetings for men, a persistent campaign was carried on to win young men to lead a religious life. The secular agencies developed considerably during the first seven years. In 1851, in the Central Association, there were 225 members and 425 associates. There were estimated to be 750 members and associates in the other branches in the metropolis. At this time there were 8 societies in London, and 16 in various parts of the United Kingdom. The 24 Associations enrolled approximately 2,700 young men.

Knowledge of this work came to America in the fall of 1851 at three different centres—Montreal, Boston, and New York. The first movement took place at Montreal, where,

through the efforts of two young men who had become acquainted with the London work through published copies of the lectures delivered before the London Association, an Association was formed on 25 Nov. 1851. In November 1851 George Petrie, who had become well acquainted with the London work during a visit to that city, called together a group of his personal friends in New York. These conferences, however, did not result in organization until encouraged by the success at Boston, where the first Association in the United States was established.

A letter published on 30 Oct. 1851, describing in detail the work of the London Association, came under the eye of Captain Thomas V. Sullivan, who was active in Christian work among seamen, and so impressed him that he determined to establish a society in Boston. His purpose was accomplished at a meeting held on 29 Dec. 1851, in the chapel of the old South Meeting House in Spring Lane. The Boston society laid great emphasis upon the Association as a social resort. It introduced the committee system, and inaugurated the plan of restricting voting and officeholding to members who were in good standing in an evangelical church. It was the Boston society which gave character and direction to the American movement. It immediately became one of the leading religious agencies of the city. Twelve hundred young men joined its membership; 16,000 copies of its constitution and by-laws were printed and scattered broadcast over the United States, representatives of the society assisted in founding Associations at other points, and through its influence, by the year 1854, some 26 Associations had been established in different parts of the Union.

Through the efforts of Chauncey M. Langdon, a government employee in Washington, and later a clergyman in the Episcopal Church, a convention of the American Associations was called at Buffalo in June 1854. This convention established an alliance of the associations of the United States and Canada, under the supervision of an executive committee which was instructed to call annual conventions, and to do everything in their power to foster and extend the work of the associations. The organization was made international at the suggestion of a delegate from the association at Toronto, Ont., who had been invited to the convention. This alliance was known as the American Confederation, and it was largely through its influence that the American movement rapidly took pre-eminence among the associations of the world.

In the meantime, through the efforts of George Williams and others, associations had been established at Paris and other points in France, and at Geneva, in Switzerland. Prior to the founding of the association, a movement known as the "Junglingsverein" had been started among young workmen in Germany in the year 1834. This had already come into friendly correspondence with the associations in England. The German associations, while not on a strictly inter-denominational basis, were invited into alliance with the Young Men's Christian Association, and have always continued in this fellowship. Since uniting with the general movement, they have greatly increased.

The culminating event of the early period was the first convention of the associations of all

YOUNG MEN'S CHRISTIAN ASSOCIATION

lands, held at Paris in 1855, at which the memorable statement of belief known as "the Paris basis" was adopted. This has been called the apostles' creed of the association, and did much to unify the movement. It was proposed by Mr. Frederick Monnier, a layman from Strasburg, and was read before the convention, all the delegates standing, "in which position it was then solemnly passed by the unanimous vote of the whole assembly. The members present then knelt together, gratefully to acknowledge the mercy of God and to entreat His benediction on the decision at which they had arrived." The basis was as follows:

The Young Men's Christian Associations seek to unite those young men, who, regarding Jesus Christ as their God and Saviour according to the Holy Scriptures, desire to be His disciples in their doctrine and in their life, and to associate their efforts for the extension of His kingdom among men.

The reports of this convention showed the estimated strength of the association movement as follows:

	Associations	Members
Continent of Europe:		
Germany	130	6,000
Switzerland	54	700
France	49	700
Holland	10	400
Belgium and Italy.....	3	60
Total	246	7,860
British Isles	47	8,500
United States and Canada...	36	14,000
Total	329	30,360

The period from 1844 to 1855 saw the association founded in the various Protestant countries, an International Alliance established on the American continent, and a uniform basis adopted by the associations of all lands. The fundamental principles of the association began clearly to emerge. Although the movement was at first primarily religious and spiritual in character, the association was led to add secular agencies for ministering to the intellectual and social needs of young men. It recognized the principle that ministering to the needs of a man is one of the surest ways to promote his religious life; and on the other hand, that the Christian religion demands the development of all human powers and their use in the service of God. It is upon these two truths, the power of environment to mold character, and the adoption of the religion of Jesus Christ to redeem manhood, body, soul, and spirit, that the Young Men's Christian Association rests its claim for a place among the agencies of the church.

Period II, 1855 to 1878. Period of Development of Association Methods.—During the years from the Paris convention in 1855 to the Geneva convention in 1878, when a central executive committee for the associations of the world was established, with headquarters at Geneva, the Young Men's Christian Associations were gradually developing a world consciousness as an organization, and slowly evolving a method of work for ministering to the needs of young men. During this period, the American associations rose to the place of pre-eminence, and the type of association developed here has in later years spread throughout the world. For convenience the American development during

this period may be further subdivided into four divisions: The period of the confederation, 1855 to 1861; the War period, 1861 to 1866; the revival of the association work after the War, 1866 to 1870; the period of adaptation of the work to the needs of young men, 1870 to 1878.

The six years preceding the Civil War were remarkable for two results in the association: the creation of the International Committee, with its work of supervision, and the great revival which stirred the entire country during the years 1857 and 1858. During these years, the central committee of the confederation was located respectively at Washington, Cincinnati, Buffalo, and Philadelphia. This migratory plan was soon found to be a source of weakness, but much good was accomplished. Annual conventions were held, and information regarding the new movement was widely disseminated. Many new associations were founded; and at the outbreak of the war there were 240 associations in America, with an estimated enrolment of 30,000 members.

In 1856, several members of the New York association established a union prayer-meeting, chiefly for men at the Dutch Reformed Church, in Fulton Street. This was carried on for nearly a year, and in the following September it was given over to Mr. J. C. Lamphier, the city missionary of the Dutch Reformed Church, with the understanding that it should be continued on a union basis. The committee of the association arranged to co-operate heartily in this meeting.

In the fall of 1857 came the financial panic which prostrated the business interests of the country. Large numbers of men began immediately to attend this noon prayer-meeting, and, under the auspices of the New York association, many more union meetings were established in different parts of the city. Simular meetings were conducted by all the Young Men's Christian Associations throughout the country. It is estimated that over 300,000 persons were added to the evangelical churches of America as a result of this revival.

The years from 1861 to 1866 in America were overshadowed by the cloud of the Civil War. The financial depression and the distractions attending the outbreak of the War brought the association to the lowest point it ever reached. The Boston membership declined from 2,400 to 700. The New York City association, at the beginning of 1862, had but 157 members; it was burdened with a debt of \$2,400, and its work had sadly declined. It is recorded that only 60 organizations survived the War; and yet, in the midst of this depression and apparent weakness, the association performed one of the most heroic tasks ever undertaken by a religious organization.

Through the influence of the association in New York, heartily seconded by those of Boston, Washington, Philadelphia, Chicago, and other places, the United States Christian Commission was organized. This was the first organized attempt, on a large scale, to minister to both the spiritual and physical needs of soldiers in time of war. The plan of work was to send out delegates with supplies and needed comforts, who should spend some five or six weeks without remuneration, nursing the sick and wounded, distributing literature, conducting evangelistic and religious meetings, bearing messages from home, and in various ways encourage

YOUNG MEN'S CHRISTIAN ASSOCIATION

ing and helping the soldiers. Over 5,000 of these delegates were sent to the front during the Civil War. The following table shows the vast efforts of this commission in raising money and supplies for the soldiers:

*RECEIPTS BY THE UNITED STATES CHRISTIAN COMMISSION.

	1862	1863	1864	1865 (4 mos.)	Total
Cash	\$ 40,760	\$358,000	\$1,297,755	\$ 828,257	\$2,524,772
Supplies	191,096	354,637	1,366,594	1,424,498	3,736,825
Totals	\$231,856	\$712,637	\$2,664,349	\$2,252,755	\$8,261,597

*Mass. United States Christian Commission, p. 799.

This was an heroic service, and won for the association the admiration and confidence of the public. In the meantime, the New York City society had secured for its secretary, Robert R. McBurney, and for its president William E. Dodge, Jr. It had on its board of directors Hon. Cephas Brainerd, who had been identified with its work from the beginning, and who had early perceived the true mission of the association. Mr. Dodge with his associates set about developing in New York a work specifically adapted to the needs of young men, and introduced a new era in association history. Mr. Dodge was in sympathy with the idea of a clean, home-like social resort for young men, and with the providing of opportunities for physical training. It was at his suggestion that the constitution of the New York City association was altered so as to provide for the erection of a gymnasium. Mr. Dodge was also influential in enlisting large gifts for the association. He was himself the largest donor to the first building.

The years from 1866 to 1870 mark the revival of the American work after the war. In June 1866 an international convention was called at Albany, which outlined a new policy for the associations. The plan of a migratory international committee was given up, and the headquarters were permanently established in New York city. Hon. Cephas Brainerd was, a year later, chosen chairman of this committee, a position which he held for 25 years. This convention announced the platform that the work of the association should be limited to young men, although it was some years before this became the actual practice. The convention established a day of prayer for young men in November, which has become a world-wide observance. It also arranged for the organizing of State committees, and the beginning of what is usually spoken of as state work. The great contribution of this convention, however, was the emphasis which it placed on the true field of the Young Men's Christian Association as distinctive work for young men. In his opening address, Mr. Brainerd said: "Our future progress rests upon an unswerving devotion to the primary objects and aims of this association—the social, mental, and religious improvement of young men. As organizations with these avowed objects, we challenge attention. As seeking these ends we are prominently before the world. Because of these things we are what we are. When we deviate from them, we trench upon ground assigned to others."

As yet there was no uniformity among the associations in America as to the conditions of membership. At the international convention held in Portland, in 1869, it was decided that only members of evangelical churches should

vote or hold office in the association, and it was stated that:

We hold these churches to be evangelical which, maintaining the Holy Scriptures to be the only infallible rule of faith and practice, do believe in the Lord Jesus

Christ (the only begotten son of the Father, King of Kings, and Lord of Lords, in whom dwelleth the fulness of the Godhead bodily, and who was made sin for us though knowing no sin, bearing our sins in His own body on the tree) as the only name under heaven given among men whereby we must be saved from everlasting punishment.

In the meantime, in New York city a determined effort was being made to erect a suitable building adapted to the needs of young men. In addition to the work already undertaken for the spiritual, intellectual, and social improvement of young men, it was decided to add a gymnasium for physical training. After an earnest canvass for funds, and a most careful study of plans, the historic building on the corner of Twenty-third Street and Fourth Avenue, which provided under one roof for the various phases of association activity, was erected. This building cost \$487,000, and was opened to the public in November 1869. Here was developed the modern type of the diversified work for the cultivation of Christian manhood, which has become characteristic of the American associations, and which is spreading throughout the world.

A unique feature of this building, which has been copied in most association structures, was the central reception-room, or lobby, in which was the public office of the secretary, and through which every one must pass upon entering the building. From this reception-room opened the reading-room, the parlors, the amusement-room, the gymnasium, the library, the educational class-rooms, and the secretary's private office. This enabled the secretary in charge to control the various activities which were housed under one roof, and to keep in touch with the multitude of young men who took advantage of the privileges of the association.

The years from 1870 to 1878 in America may be characterized as a period of adaptation of the work of the association to the needs of young men, and the extension of this work to various classes of young men. It is an interesting fact that, as soon as the organization specialized its work and limited it to young men, it immediately found a large field for service. In 1872, at Cleveland, a branch association was founded for work among railroad men. This met with a hearty response from the men themselves. A secretary was employed, rooms were opened at the railway station of the Lake Shore & Michigan Southern road, and an effort made to extend the work elsewhere. Similar societies were also organized at a number of the terminal points, and in the fall of 1875 the attention of Mr. Cornelius Vanderbilt was called to this work. Through his endorsement, other railroad officials became interested in this movement. It was soon found that it was worth while

YOUNG MEN'S CHRISTIAN ASSOCIATION

for railroad corporations to provide the facilities and attractions of a Young Men's Christian Association for the comfort of their employees.

As early as 1858, at the State Universities of Michigan and Virginia, student Young Men's Christian Associations had been organized. Early in the 70's, Mr. Robert Weidensall organized similar societies in a number of colleges. By 1876 there were 25 college associations, with about 2,500 members. Through the influence of Mr. Luther D. Wishard, a student at Princeton, representatives of all college associations were invited to the international convention held at Louisville, Ky., in 1877. This resulted in the inauguration of the inter-collegiate movement as a department of the work of the international committee. An extended effort was also made during this period among German-speaking young men, and toward its close a work was inaugurated among colored young men.

One of the most important agencies developed during this time was the work of supervision. The international committee located in New York steadily grew in resources and influence. A number of the most prominent Christian business men of New York city and other parts of the country accepted positions of responsibility upon this committee. In 1868, Mr. Robert Weidensall became the first traveling secretary, being located in the West with headquarters at Omaha, afterward Chicago. He is still in the service of the committee. Mr. Weidensall has done much pioneer work, organizing state committees, and introducing many new phases of work for young men. In recent years he has particularly fostered what is known as county work for young men in rural districts. Mr. Richard C. Morse accepted a position with the international committee in December 1869, first as editor of the 'Association Monthly,' and in 1872 as executive secretary of the committee, in which position he has continued until the present time.

At the close of this period, 1878, the American international committee had in their employ eight traveling secretaries, and in addition to the general work, were supervising work for railroad men, college students, German-speaking young men and colored young men. The budget for 1878 showed an expenditure for supervision on the part of the international committee of \$16,875. The American associations at this time reported 141 employed officers. Of these, 100 were general secretaries, 21 assistants, 12 State, and 8 international secretaries.

In other lands, while war, ecclesiastical conditions and general conservatism retarded the growth of the associations, a marked development had taken place. Every three years, conventions of the associations of all lands were held in different European cities. To these, the American associations since 1872 have regularly sent representatives. During the early 70's, Mr. Moody made his evangelistic campaigns in the British Isles, and did a great deal to stimulate the work of the Young Men's Christian Association in securing money for buildings, in arousing spiritual zeal, and in calling the attention of the Church to this important work. In 1878, some 40 representatives of the American associations attended the world's convention, which met at Geneva, Switzerland. Up to that time there had been no established headquarters for the world's work. General affairs had been ad-

ministered from London through Mr. W. E. Shipton, the secretary of the London association. It was chiefly through the influence of the French and American delegates that the Geneva convention voted to organize the work of the associations in all lands under an advisory committee, which should have a quorum located at Geneva, Switzerland. Col. Charles Feraud, an officer in the Swiss army, and a man with bright business prospects in Geneva, consented to give up his calling and accept the position of general secretary of this committee. By the year 1878, with the establishment of the world's committee, the Young Men's Christian Associations of the world may be said to have developed their ideal of work for young men.

Period III, 1878 to 1904. Period of Expansion.—Expansion has been the striking characteristic of the period from 1878 to 1904. The American associations have increased in membership three and one-half times, from 99,000 to 350,455; in value of property, from \$2,295,000 to \$28,827,886; in the number of buildings, eight-fold, from 56 to 460; in employed men, fourteen-fold, from 141 to 1,934; the current expenses for operating the associations have increased ten-fold, from \$376,000 to \$3,583,506. (These figures are taken from reports for 1903.)

The two factors which have most profoundly influenced the Association movement, during this period, have been the securing of property, and of trained secretaries and directors who give their whole time to this service. The carrying on of an all-round work for young men—physical, social, intellectual, and spiritual—demanded not only experienced and able men to conduct the work, but commodious and properly adapted structures in which it could be housed.

The discoverer and demonstrator of the secretaryship was Robert R. McBurney, who was secretary of the New York City association from 1862 until his death in 1868. Under his leadership, this office was developed and the number of employed men increased. Of all the agencies the association movement has brought forth, the most vital is the secretariate. To this may be attributed its permanence and continued power. There are now nearly 2,000 men devoting themselves to this service as a life work. The pre-eminence of the American associations is chiefly due to this policy of employing salaried officers. About five-sixths of the secretaries employed by the associations of all lands are in the United States and Canada.

Not only have men been employed for supervisory work, but since 1870 there has been an increasing demand for Christian young men to devote their lives to service in the association as physical directors. Three hundred and fifty-three of these men are now employed. To the Christian physical director, the Young Men's Christian Association owes the development of the physical department, which aims not only to give young men physical training, but rugged, vigorous bodily development. This department has proved a great attraction to young men. In 1896, the 'Year Book' reports 32,672 men as using the physical department of the association. In 1900, there were 80,433, and for 1908 there are reported 129,193 individuals, of whom 35,210 were boys. Much of the progress in this department has been due to the leadership of Dr. Luther Halsey Gulick, who became instructor of physical training at the Association Train-

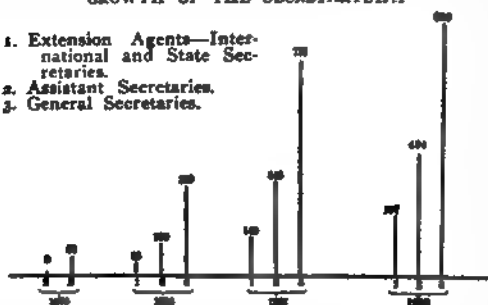
YOUNG MEN'S CHRISTIAN ASSOCIATION

ing School at Springfield in 1886, in which position he continued until 1900. In 1888, he was also appointed secretary of the international committee for the physical department, in which office he served until the spring of 1903. The Young Men's Christian Association is doing the most extensive work in physical training of any agency in the country. It is also interesting that more than 40 per cent of the physical directors in academies and colleges have been furnished by the association. The physical department has proved not only a means for physical well-being, which is much needed under modern city conditions, but also a means of leading young men into lives of personal purity.

The following table shows the employed officers in the association exclusive of physical directors:

GROWTH OF THE SECRETARYSHIP

1. Extension Agents—International and State Secretaries.
2. Assistant Secretaries.
3. General Secretaries.



In 1885, at Springfield, Mass., a school was established for the training of general secretaries for the Young Men's Christian Association. The year following, a physical department was added for the training of physical directors. This school at first offered a two-years' course of study, which was later extended to three years. In 1890, a similar school was established at Chicago. This institution also conducts a summer term at Lake Geneva, Wis. In 1902, a summer school was established at Silver Bay, Lake George. These educational agencies seek to thoroughly train officers for the Young Men's Christian Association as a life work. About one sixth of the officers of the association have received training at these institutions. The courses of study cover the Bible, Church history, psychology, sociology, religious pedagogy, physiology, anatomy, anthropometry, physical diagnosis, physiology of exercise, gymnastics, athletics, aquatics, history of the Young Men's Christian Association, methods of work among young men, etc. There are about 150 students enrolled in these two institutions in addition to those attending the summer institutes.

The building movement in America has developed with increasing momentum. In 1890, there were 205 buildings, valued at \$8,350,000, in the United States and Canada; in 1900, there were 359; in 1902, there were 460. During the past year, 40 association buildings have been erected. There is no greater testimony to the confidence of Christian philanthropists and business men in the Young Men's Christian Association and its work than the investment of large sums of money in association property. The type of architecture developed by the Young Men's Christian Association is of the club order, its buildings being home-like and social.

One of the striking developments of this period in the city work has been the growth of the educational classes. Immediately upon the erection of the building on the corner of Twenty-third Street and Fourth Avenue in New York city, evening classes were started in different subjects for young men. Similar classes were carried on in other cities, and by 1892, 20,526 different men were under instruction. In 1892, a secretary for the educational department was appointed by the international committee, and this work has been systematized and greatly developed. International examinations are now held annually, in which large numbers of students take part. International certificates are accepted by more than 100 different colleges and institutions. An illustration of the growth of this department is seen in Boston, where the association in 1903 reported 1,184 different students, studying in its evening classes. This association has a law school which has been given by the legislature a charter, granting the right to confer degrees, and the past year graduated 19 students who were admitted to the Massachusetts bar. Nearly every association contains a reading room, 700 report having libraries, and many others are distributing stations for public libraries. In January 1904, 30,600 different students were reported as taking class work; the total expense for class instruction was \$111,000, and the receipts and tuition fees from the students was \$86,099. In that year, 1,426 students won international certificates.

In its religious work the associations have made the most marked progress in recent years. This has now been organized into a system, having four features: (1) Religious meetings for men, chiefly evangelistic; (2) personal work for individuals, which seeks through individual interviews to win young men into the Christian life; (3) Bible study, which seeks to organize young men into Bible classes and Bible departments for their religious education; (4) missions, which is an effort to interest young men in the study and support of the work of the associations in non-Christian lands.

The religious meetings of the association for men are generally held on Sunday afternoon, and within recent years what is known as the "big meeting" has become common. This effort began at Trenton in 1894, where the average attendance for the first year was 427, the second 608, the third 727, and for the fourth over 1,000. This meeting has continued with equal results to the present time. There are now some 30 associations which conduct these large men's meetings, the ones in Washington, D. C.; Baltimore, Md., and Springfield, Mass., averaging over 1,000 each in attendance. The Cleveland association has inaugurated what is known as the Sunday Club, where a continuous program of music, Bible classes, addresses, an evening tea, and after-dinner talks, occupy the afternoons of Sunday during the winter. The most notable leader in evangelistic work in recent years is Mr. Fred B. Smith, secretary of the international committee for religious work. The religious work prospectus of the city and railroad associations reports 18,716 professed conversions for the year 1903, 22 per cent of whom had already united with local churches.

In its Bible study department, the progress has been even more marked, particularly in the last five years. In 1901, in the city associations,

YOUNG MEN'S CHRISTIAN ASSOCIATION

19,160 students were reported; in 1902, 25,092; for 1903, 31,300; this is in addition to the large number of men studying in shop Bible classes. The student associations have a thoroughly systematized plan of Bible study, covering the four college years. Student conferences are held at Northfield each summer, and at five other points at which leaders for the Bible classes for the coming year are trained. Reports for the summer of 1904 show that nearly 30,000 undergraduates will be enrolled in these classes the coming year.

An important phase of the religious work of the association is the interest in foreign missions which it has aroused among young men. The student volunteer movement, which is an outgrowth of the student department, is the chief missionary agency in the colleges of this country. It annually secures a large number of students to volunteer for foreign missionary service. In 1903, 3,246 men were reported as in mission study classes. The last student volunteer convention, which was held at Toronto in 1902, was attended by 2,200 delegates.

The latest period of association history has also been marked by a great extension in the work for different classes of young men. In August 1895, the world's student Christian federation of under-graduates of all lands was established. This now enrolls 65,000 members, in 1,400 institutions, in 30 different countries, and is the largest organization among undergraduates in the world. In the United States and Canada the movement has been extended to professional schools, theological seminaries, State universities, and other institutions of learning. There are now 716 college associations upon this continent, enrolling 44,500 students. Thirty American student associations own buildings valued at \$1,000,000. There are now 98 student secretaries devoting their whole time to this work.

The work for railroad men has become one of the most remarkable features of Christian endeavor. Railroad corporations which control three fourths of the railroad mileage on this continent contributed last year over \$200,000 toward the current expenses of the railroad associations now in existence. There are 122 buildings, valued at \$1,800,500, occupied by these associations, with a membership of 62,300, a gain of 30,000 in three years. There are 301 secretaries engaged in this department.

Since 1879 the international committee has employed a secretary to develop the work among colored young men. There are to-day 40 Indian associations, with 1,600 members, under the direction of a traveling secretary, who is a native American Indian.

Largely as an outgrowth of the work for students in other lands, the American international committee was invited by missionaries in India to inaugurate a work among young men in non-Christian lands. This work has always been carried on in subordination to the Church, and as a supplementary work where missions have already been developed. There are now 37 secretaries of the American international committee in India, Ceylon, Japan, China, and Brazil.

With the outbreak of the war with Spain, secretaries were sent out with tents and suitable equipments, and a successful effort was under-

taken to preach the gospel to the soldiers and sailors. The army in the Philippines was provided for in a similar way, and some of the Canadian regiments sent to South Africa were equipped in like manner. This work has been established as a permanent department of the international committee. There are now 269 army posts at which work is being done. Seventy-five tons of equipment in 1903 were shipped to Alaska, China, Philippine Islands, Cuba, Porto Rico, and to different parts of the United States. Three army buildings have been erected.

Even before the Spanish war began steps had been taken to inaugurate a work among the seamen of the navy, and after the war a building was equipped for seamen at the Brooklyn navy yard. This department has developed rapidly, and at the present time there is an organized movement among the seamen of the navy, which is full of promise. Through the munificence of Miss Helen Millar Gould, who has contributed largely toward the railroad and army work, a splendid building has been erected for the Naval Association, near the navy yard in Brooklyn, at a cost of \$450,000. Work is now being done at two other home ports, and on a large scale. There are 27 secretaries in the army and navy associations of the United States.

For many years the work of the associations was limited to young men between 16 to 17 years of age, and upward. It is an interesting sociological development that, in the prosecuting of its work for young men, the association has been led to give its attention to work among boys. Careful study led to the conviction that effort ought to begin at the age when the boy is becoming a man—at the dawn of adolescence. There are almost as many boys in cities between the ages of 12 and 17 as there are young men. The first boys' department was organized at Salem, in 1869, but it is only in recent years that a determined effort has been made to organize a work among boys. In 1890 there were four secretaries giving their time to this department. In 1895 this number had increased to 17, and in 1903 to 107. There are now 46,000 members of boys' departments, and 13 buildings devoted exclusively to boys' work. Five hundred and seventy-six associations have either branches or departments for work among boys. The most unique feature of this department is what is known as the boys' camp, which was first developed by the Young Men's Christian Association, and is already a large factor in Christian work. In 1903 214 summer camps were conducted by the American associations.

One of the most important developments of recent years has been the extension of the association among men engaged in industrial pursuits. The associations were originally for commercial young men. Afterwards associations were organized for students, and later for railroad men. The city associations in recent years have been attracting large numbers of skilled mechanics to their membership, and to-day in the eastern associations, 35 per cent of the members belong to this class. Industrial associations existed in 1897 in connection with the Johnson Steel Plant at Lorain, Ohio, and an association building at a cost of \$25,000 was erected for the use of the workmen. Similar

YOUNG PEOPLE'S CHRISTIAN UNION — Y. W. C. A.

associations have been erected at Proctor, Vt.; Wilmerding, Pa.; Stampo, Ark.; Douglas, Alaska; Cananea, Mexico, and at several other places. An extensive work is also done among the miners in Pennsylvania and the lumbermen in several northern States. In 1902 the Brooklyn Young Men's Christian Association employed a secretary for the organizing of association work among the street railway employees of that city. They now have a building erected at a cost of \$30,000. This is a club house with reading room, library, educational class rooms, auditorium, gymnasium, game room with pool and billiards, also bowling alleys, baths, etc. Similar departments have been organized in a number of other cities.

The industrial revolution which attracted the young men to the city, and so created the basis for the Young Men's Christian Association, has to a large extent depleted the rural districts of young men. At the same time it still remains true that a majority of young men are found in the country. There are 8,000,000 young men in the country districts of the United States and Canada. For many years an effort was made to discover some method of carrying on association work among these men. What is known as the county work has proved so successful that in 10 different States there are now county organizations, the most extensive work being carried on in Kentucky, where eight county secretaries are employed. The plan of work is a county committee, which employs a traveling secretary who will supervise and stimulate Christian work among the young men in the county, organizing Bible classes, men's meetings, in many cases establishing reading rooms, social parlors, sometimes educational classes, and in a few instances organizing clubs for athletics of various kinds. County conventions are held, deputation Sundays, and a carefully systematized effort is made through the entire county.

Whether the Young Men's Christian Association has reached its final form, no one would be bold enough to affirm. It is remarkable that it should have grouped together such a variety of agencies upon the simple platform of young men advancing the Kingdom of Christ among young men. Through the three periods of its development, the association has evolved into an institution with an enlarged ideal, closely akin to that of the Christian university. It is still animated by the evangelistic, spiritual purpose of the original band of young men who rallied around George Williams 60 years ago. But, while keeping uppermost this ideal, it has endeavored to do, in a popular way, for the multitudes of young men of our cities, what the Christian university, in a more scholarly way, is doing for the young men who are to enter the professions. There is every evidence that the association has only begun its career of usefulness, and that in the future it will become a manifold more important factor than in the past.

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L. L. DOGGETT, Ph.D.,

President International Young Men's Christian Association Training School, Springfield.

Young People's Christian Union, an organization in the United Brethren Church, founded 5 June 1890. It is a union of all forms of young people's societies within the church, uniting them for the purpose of denominational direction. There are now in this union 1,971 societies, of which 251 are junior societies. The total membership is 80,243.

Young People's Society of Christian Endeavor. See CHRISTIAN ENDEAVOR, YOUNG PEOPLE'S SOCIETY OF.

Young Pretender, The, a title applied to Charles Edward Stuart, son of the Pretender. He was defeated by the Duke of Cumberland at Culloden 16 April 1746.

Young Women's Christian Association. The World's, has headquarters in London, and embraces organized associations in the following countries: Great Britain, Canada, the United States, Denmark, Norway, Sweden, Finland, France, Germany, Hungary, Italy, and India. Many of these countries hold national conventions and issue national organs.

The affiliated body in the United States is known as the American Committee, organized in 1886. Its headquarters are in Chicago. At the present time there are connected with the American Committee 24 State associations, embracing organized work in nearly every State in the Union and employing 28 State secretaries. There are affiliated with the American Committee 93 city associations and 10 branch associations in six cities. Three of the 93 city associations are gospel settlements for women. The total active membership of the city associations is 50,638. For the past year 306 Bible classes, 434 physical training classes, 676 educational classes, 227 domestic science, and 225 domestic art classes are reported; 52 associations conduct lunch rooms for women, 35 conduct boarding homes. There are also employment bureaus, travelers' aid work, summer homes, and religious meetings maintained. In 227 factories association workers carry on meetings and clubs for young women.

There are 501 student associations affiliated with the American Committee, with a total membership of 35,181; 269 of these have rooms or buildings, all hold regular religious meetings and missionary meetings. They enroll 4,756 young women in mission classes, and 10,567 students in regular study of the Bible.

The American Committee conducts four summer conferences, attended the last season by 2,026 persons. A training institute for secretaries is conducted in Chicago, and a monthly periodical, the 'Evangelist,' is maintained as the national organ.

The International Board of Women's and Young Women's Christian Associations embraces 54 associations in various cities throughout the United States. Of these 40 report boarding homes, 14 report vacation homes, 37

YOUNGHUSBAND—YOUNGSTOWN

report libraries, 20 report women's restaurants, 27 report educational classes, 26 report domestic science and art, 21 report physical classes, 15 have travelers' aid work, 26 have employment departments, 27 maintain work of city relief, hospital, rescue work, homes for the aged and incurables, orphans' home and maternity work, 15 conduct women's exchanges.

ELIZABETH WILSON,

Secretary of the Training Department, Chicago.

Young'usband, George John, English soldier; b. 9 July 1859. Entered the army 1878, and was promoted successively lieutenant 1880, captain 1889, major 1896, and lieutenant-colonel 1900. He served in the Afghan war in 1878-80, in the Sudan in 1885, on the northwestern Indian frontier in 1886, and in the Burmese expedition of 1886-7. In 1895 he was a member of the Chitral relief force, and in 1898 was detailed to accompany the American forces in the Spanish-American war and the subsequent campaign against the Philippine insurgents. He fought in the second Boer war in South Africa (1899-1902), and was severely wounded. Subsequently he was assigned to the Indian staff corps, and in 1904 was the leader of a British diplomatic mission to Tibet which aroused considerable discussion by its unwarranted assumption of the character of a punitive expedition.

Youngstown, Ohio, county-seat of Mahoning County, sixth city in the State, 7 miles north of the southern boundary of the Western Reserve, half-way between Cleveland and Pittsburgh, 67 miles from each; extends nearly 6 miles along the Mahoning River, northwest and southeast, covering 10 square miles. It began where the valley widens and spread mainly north and west to higher land. Since a connecting viaduct was built in 1899 the south side has grown rapidly. The principal business street is Federal, nearly 3 miles long, running through the small Public Square. The best residential streets are Wick, Lincoln and Madison avenues and Bryson street, which are beautifully shaded.

Municipal Service and Improvements.—The city has 125 miles of streets, of which 23 are paved. The street-cleaning service employs 60 men, costs \$34,000 annually and is fairly efficient. There are 48 miles of sewers, discharging by main sewer into the river below the city. The city owns the Holly water-works, installed 1872. This has cost, including efficient filtration plant which was established in 1904 to purify supply from river, \$1,000,000, has 78 miles of mains and supplies about 3,500,000 gallons daily, the expense being \$27,000 annually. The city as a whole is very healthy; average general death rate for last four years being 15.04. The police department has 65 men, 49 patrol boxes, and costs \$66,000. The high pressure immediately obtainable from mains renders many steam fire engines unnecessary, but the fire department has two, one chemical engine, six hose carts, seven stations, employs 44 men, and costs \$58,000. Three street railway companies operate in all 132 miles electric line, 29 in city proper, and 103 connecting with surrounding cities. Another of 60 miles reaching East Liverpool and undeveloped coal territory south is under construction. Gas is still used, but electric lighting is general. Natural gas from Pennsylvania furnishes domestic

fuel. There are two telephone companies with 4,800 instruments.

Parks and Cemeteries.—The only public park within the city is Wick Park, which has an extent of 47 acres, a natural grove near the northern limits, named for the donors. Just outside but readily accessible, extending southwest on both sides of the stream for 3 miles, is Mill Creek Park of 457 acres, of striking natural beauty. From a waterfall 25 feet high at the south the creek flows through a gorge like a cañon, with steep sides, often rocky, rising sometimes over 100 feet, widening in places and well covered with fine trees. The park, which cost \$260,000, has 9 miles of attractive drives and a lake of 28 acres. Idora Park is a popular pleasure resort of 20 acres located near the above falls. Oak Hill cemetery, 27 acres, begun in 1846, is well situated and possesses some fine monuments. Belmont Park just opened, has 100 acres, and Calvary, just west of the city, with an extent of 50 acres, is owned by the Catholic Church.

Chief Buildings.—The most notable is the handsome steel-frame Dollar Savings and Trust Company. The government building is wholly inadequate, a monument to mistaken economy; there is no municipal building and the court-house is now too small. Aside from banks and churches, there are the Y. M. C. A., one of the finest in the State, costing \$90,000; City Hospital; Public Library; Rayen School, in Ionic style with inharmonious addition; Lucretia K. Baldwin Memorial Kindergarten; Elks and Odd Fellows.

Commerce and Manufactures.—The P. & O. canal, built in 1839, stimulated mining of large deposits of Brier Hill block-coal which long furnished a principal part of Youngstown's commerce and warranted building the railroad to Cleveland, opened in 1856. There are now the Erie, Pennsylvania, B. & O., Lake Shore, and Pittsburg & L. E. systems, with 67 passenger trains daily and 155 miles of track within the city, crowded with the immense tonnage of "Mahoning Valley" iron and steel industries, of which Youngstown is the centre.

The second blast furnace in the United States to use raw block-coal and a rolling mill for making bar iron were both built here in 1846. Other iron works, which have formed the main industry of the place, followed, using richer lake ore and Pennsylvania coke and coal since native ore and coal were exhausted. The Ohio plant, making steel and rails, started in 1895. There are now in the city eight blast-furnaces, two steel plants, and five rolling mills, with an annual capacity of 1,140,000 tons pig metal, 1,100,000 tons billets and rails, and 600,000 tons finished material, whose actual tonnage in and out for 1903 exceeded 5,500,000, to which similar concerns, just outside but belonging to the city, and kindred industries making boilers, bridges, cars, cranes, engines, forgings, machinery, metal lath and furniture, pipes, tubes, shafting, steel-castings, stoves and washed-metal added 1,000,000 tons. The investment in these industries in and adjoining the city exceeds \$26,000,000. There are also large oil-cloth and rubber plants and works for making automobiles, brass castings, cement, flour, leather, and powder. The last census gives 249 industrial establishments outside iron and steel, with a capital

YPRES — YPSILANTI

of \$4,818,243; employees, 2,716; wages paid, \$1,458,821; cost materials, \$3,553,156; value products, \$6,597,245.

Finances and Banking.—The assessed valuation of the city is \$22,317,210 with tax rate \$33 but usually under \$30; bonded debt, \$880,304; annual interest charge, \$42,696. The city owns property valued at over \$2,500,000. City income by last annual reports, \$385,000; expenditures, \$378,000. Post-office receipts are over \$100,000. There are five national banks and one trust company with capital and surplus \$3,834,000 and deposits \$10,151,000.

Churches.—There are here 46 Protestant churches, chapels and missions, most numerous being Methodist 11, Presbyterian 10, Lutheran 8; 10 Catholic churches, with 1 Ursuline convent, and 2 Jewish synagogues. Of the churches 41 are English, 4 German, 3 each Welsh and Swedish, 2 Slovak, and 1 each Italian, Polish, and Arabic. The best church buildings are St. Columba's, St. John's, Trinity, and the beautiful Helen chapel.

Benevolent Institutions.—City hospital, with substantial limestone buildings, best modern equipment, cost \$200,000, and Mahoning Valley, conducted by Sisters of Charity; Y. M. C. A., with large membership and well sustained; Children's Home, Florence Crittenton Home, five free kindergartens, an active humane society, and various fraternal societies.

Education.—There are 22 public school buildings, 199 teachers, and 8,000 pupils enrolled; salaries and expenses about \$200,000. The Rayen School, founded in 1854 by Judge William Rayen, with fine building and large grounds, is conducted as the city high school with 450 pupils. There are eight parochial schools with 36 teachers and 2,470 scholars, several private schools, and the Y. M. C. A. sustains good educational classes.

The R. McMillan Free Public Library is well managed, and has 20,530 volumes. The Rayen School has a good library.

Newspapers.—Two daily, *Telegram* and *Vindicator*, each with several other editions; three weekly; one Catholic monthly.

Government.—A biennial mayor, president of council, one councilman from each of seven wards and three at large, board of public service of three, solicitor, auditor, and treasurer. The board of public safety of two, sinking fund trustees, and board of health are appointed by the mayor; city engineer and clerk by council; other officers elected by the city.

Population increased from 8,075 in 1870 to 44,885 in 1900, and rapid growth since makes conservative estimate for end of 1903 over 56,000, besides several thousand belonging to city but outside the boundary. In 1900 the percentage of foreign born was 27.2; native of foreign parentage, 41, leaving but 31.8 of native parentage. In 1910 it was 79,066.

History.—The township was named from John Young, who purchased it from the Connecticut Land Company in 1796. David Tod, afterward "war governor," operated first coal mines and led in establishing the canal and first railroad. Sturdy foreign elements, attracted later by the heavy industries, have combined with descendants of early residents, largely from New England, and others, to form

an enterprising, industrious, upright and patriotic community whose future, with first-class plants established, is bright.

WILLIAM H. BALDWIN.

Ypres, è-pr, (Flemish, *Yperen*), Belgium, a town in the province of West Flanders, in a plain, on both sides of the Yperlee, 28 miles south-southwest of Bruges, 53 miles by rail. Ypres formerly was one of the most important manufacturing towns of Flanders, and in the 14th century had 200,000 inhabitants and employed 4,000 looms. Its manufacturing prosperity has long departed, but a striking monument remains in its cloth-hall (Les Halles), an immense building of the 13th and 14th centuries, in the form of an irregular trapezium, surmounted by a square tower or belfry. One of its wings is used as the town-house, and other parts are occupied by different public establishments and concert-rooms. The Gothic cathedral of Saint Martin dates from the 13th century, and is one of the most remarkable religious edifices in Belgium. The chief manufactures are cottons and lace. Ypres was made by Louis XIV. in 1688 one of the strongest fortresses of the Low Countries, and in the great European wars seldom escaped a siege or bombardment. It is no longer fortified. Jansen (q.v.) was bishop of Ypres, and is buried in the cathedral of Saint Martin. Pop. about 19,000.

Ypsilanti, Ip-si-lan'ti, a distinguished Fanariot family descended from the Comneni and of prominence as defenders of Greek liberties. Its most conspicuous members are: ALEXANDER: b. Constantinople 1725; d. 1805; hospodar of Wallachia 1774-82, and again in 1706-8, and of Moldavia 1784-92. He propounded a scheme for the fusion of the Greek and Turkish people, but having incurred the suspicion of the Porte, was executed. CONSTANTINOS, his son (b. Constantinople 1760; d. Kiev, Russia, 28 July 1816). He early planned the freedom of Greece, but his scheme was prematurely discovered, and he fled to Vienna. Pardon by the Sultan, he was hospodar of Moldavia 1799-1805. He then went to Russia, but returned to Bucharest with 20,000 men, in the hope of freeing Greece. The peace of Tilsit interrupting his plans, he returned to Russia. ALEXANDER, eldest son of the preceding (b. Constantinople 12 Dec. 1792; d. Vienna 31 Jan. 1828). He went with his father to Russia and, joining the Russian army, served with distinction in various campaigns. In 1820 he became head of the secret association known as *hetaeria*, whose aim was the independence of Greece, and in March 1821 entered Moldavia and raised the standard of revolt among the Rumanians. He was defeated by the Turks at Dragaschen, near Galatz, 19 June 1821, fled to Austria, and was imprisoned six years at Munkacs, Hungary. DIMITRIOS, brother of the preceding (b. Constantinople 25 Dec. 1793; d. Nauplia 16 Aug. 1832). After serving in the Russian army, in 1821 he joined the Greek patriots in the Morea, and played a brilliant part in the struggle. But though a brave and successful general, as his victory at Tripolitza and his defense of Argos show, his influence was constantly undermined by the "native" party, who never forgot that he was a Fanariot and therefore a foreigner in part. In 1827,

however, he was made commander-in-chief of the Greek army, but the ungenerous course adopted toward him by the government of Capo d'Istria compelled him to resign 1 Jan. 1830, and he then withdrew from public affairs.

Ypsilanti, Mich., city in Washtenaw County; on the Huron River, and on the Lake Shore & M. S., and the Michigan C. R.R.'s; 30 miles west of Detroit and eight miles southeast of Ann Arbor. It is on both sides of the river. In 1807 there was an Indian trading post on the site of the present city. In 1824 it was laid out as a town, became a village in 1832, and was chartered as a city in 1858. It has considerable manufacturing interests. In 1900 (government census) the total capitalization of the manufacturing establishments in the city was \$898,161; the value of the annual products was \$1,318,793. The chief manufactures are flour, paper, dairy products, underwear, agricultural implements, sash, door, and blinds, tags and labels, pumps, cement and foundry and machine shop products. The city is the commercial centre of a rich surrounding country. It contains 9 churches, and the Michigan State Normal College, a high school established in 1849, a business college, public elementary schools, kindergartens, and public and school libraries. The two banks have a combined capital of \$125,000, and, in 1903, had deposits amounting to \$1,056,570. The city owns and operates the electric-light plant and the waterworks. The government is administered under a charter of 1898, and is vested in a mayor, who holds office one year, and a common council of ten members. Pop. (1910) 6,230.

Yreka, wi-ré'ka, Cal., city, county-seat of Siskiyou County; on the Yreka Creek, and on the Yreka Railroad; about 355 miles north of San Francisco. It is in an agricultural and lumbering region, in which considerable attention is given to fruit cultivation and stock-raising. There are large stock yards, a lumber mill, and fruit-packing houses. The city has one bank with a capital of \$100,000, and a county high school. Pop. (1910) 1,390.

Yriarte, é-ré-á-r'tá, Charles Emile, French journalist and author: b. Paris 5 Dec. 1832; d. there 10 April 1898. He studied architecture as a pupil of Constant Dufeux, became inspector of imperial asylums, and after this post was abolished, went on the Spanish expedition to Morocco in 1859 as correspondent and artist for the 'Monde Illustré,' and in 1860 on Garibaldi's campaign in Sicily in the same capacity. From 1864 to 1870 he was editor-in-chief of the 'Monde Illustré'; in 1881 he was made inspector of fine arts, and in 1889 member of the superior council of fine arts. He wrote for the 'Figaro,' and for 'La Vie Parisienne' over the pseudonym 'Marquis de Villemer.' Among his numerous volumes of various character are: 'Portraits Parisiens' (1865); 'Les Tableaux de la Guerre' (1870), on the war in Morocco; 'Venise' (1877); 'Autour du Concile' (1887); and several works on the Italian Renaissance, such as 'Florence' (1880); 'Matteo Civitali, sa Vie et son Œuvre' (1885); 'Autour des Borgia' (1890), and 'Maso di Bartolommeo dit Masaccio' (1894).

Yriarte, or Iriarte, Juan de, Spanish linguist: b. Orotava, island of Tenerife, 15 Dec.

1702; d. Madrid 23 Aug. 1771. In 1714 he was sent to school at Paris, afterward studying English in London and jurisprudence in Madrid, where he presently obtained a post in the royal library. In 1732 he became chief librarian and in 1742 translator for the ministry of foreign affairs. He published an important 'Codices græci manuscripti' (1759), and wrote many Latin and Spanish epigrams and proverbs, Latin poems, etc., included in his 'Obras Sueltas' (4 vols. 1774).

Yriarte, or Iriarte, Tomas de, Spanish dramatist: b. Orotava, island of Tenerife, 18 Sept. 1750; d. Madrid 17 Sept. 1791. He began to write in boyhood and in 1770 published his comedy, 'Hacer que hacemos,' under the pseudonym, 'Tirso Ymareta.' In 1780 he published a didactic poem, 'La musica,' and in 1782 'Fabulas literarias,' considered the best fables in the Spanish language. He also wrote the first regular comedies in Spanish, the best being 'The Spoiled Child' and 'The Ill-Bred Young Lady' (1788), and published Spanish translations of French plays, Horace's 'Ars Poetica' (1777), and four books of the 'Aeneid.' In 1771 he succeeded his uncle, Juan de Yriarte (q.v.) as royal librarian.

Ysaÿe, é-si-yè, Eugene, Belgian violinist: b. Liège, Belgium, 16 July 1858. He studied at the Liège Conservatory and subsequently with Wieniawski and Vieuxtemps at Brussels. He made many successful European concert tours and in 1880 became a professor in the Royal Conservatory of Brussels. He has originated a new school of violin playing, embracing features of the German, the French, and the Belgian schools, and is considered one of the leading violinists of the world. He visited London in 1889, and in 1894 and 1904 made concert tours in the United States.

Ysleta, é-slá'ta, Texas, city in El Paso County; on the Rio Grande, and on the Texas & P., and the Southern P. R.R.'s; 12 miles east of El Paso. It is in a fertile agricultural region, the productive Rio Grande Valley, in which fruit and grains grow in abundance. In 1540 Coronado discovered here a village of Pueblo Indians. He founded here a colony, erected a church and provided teachers for the Indians. The city claims to be the oldest in the State. Several of the descendants of the Pueblos are residents of the city. Population is more than 2,000; about one third are citizens of the United States, and nearly all the others are Mexicans and Indians.

Yssel, Isel, or IJssel, Netherlands, the name of several rivers, chief of which are: (1) the Nieuw Yssel, one of the principal arms of the Rhine, which leaves that river below Arnheim, flows northeast for 16 miles to Doesburg, where it receives the Oude Yssel from Westphalia, then northeast, north, and northwest, through Gelderland and Overijssel, past Zutphen and Deventer, receiving the Borkel and Schipbeek, emptying at Kampen by many arms into the Zuyder Zee, and forming a constantly widening delta. It is one of the five main arms of the Rhine, is 320 feet broad at Zutphen, 764 at Kampen, and 90 miles in length. (2) The Neder Yssel, an arm of the Leek, which leaves that stream at Vianen, flows west through Utrecht, at Oudewater enters southern Hol-

YTTERBIUM — YUCCA

land and flows southwest past Gouda to join the Maas, forming at its mouth the island of Ysselmonde. Length 30 miles.

Ytterbium, a rare chemical element belonging to the Yttrium group. Discovered by Marignac in 1878 in the mineral gadolinite. Also found in other minerals occurring in Siberia, Scandinavia, and Greenland. Symbol, Yb.; atomic weight, 173. Its oxide Yb_2O_3 forms colorless salts with sulphuric acid, etc.

Yttrialite, a native silicate chiefly of thorium and the yttrium metals. It occurs in Llano County, Texas, in grayish-olive-green masses, associated with gadolinite, and other minerals which have been mined as a source of the rare earths.

Yttrium, a rare chemical element discovered 1794 by Gadolin in the mineral gadolinite from Ytterby. It is always found in combination, some of the minerals containing it being gadolinite, xenotime, euxenite, yttrioantalite and polycrase. Usually separated from the mineral by use of sulphuric acid or aqua regia. The element is obtained by heating the chloride with metallic potassium, by electrolysis of a molten mixture of the chloride and sodium chloride, or by heating the oxide with magnesium. It is a grayish-black, lustrous, metallic powder that burns in the air to the oxide Y_2O_3 . Soluble in dilute acids. Symbol Y. Atomic weight 89. Valence 3. It forms a great many compounds closely resembling aluminium, but unlike that element forms no alums.

Yuba, yoo'bā, a river in California, formed by the junction of three rivers, North, Middle, and South, which have their sources in the Sierra Nevada. The Yuba enters the Feather River just below Yuba City. In its upper course it has many picturesque gorges, and several cascades.

Yuba City, Cal., town, county-seat of Sutter County; on the Feather River, near the mouth of the Yuba River, and on the Southern Pacific Railroad; about 40 miles north of Sacramento. It is in a fertile agricultural region, in which fruits are among the important productions. The industries are chiefly connected with farm products. The town has one bank, Farmers' Co-operative Union of Sutter County, with a capital of \$50,000. Pop. (1890) 1,071; (1900) 1,488; (1910) 1,160.

Yucatan, yoo-kā-tān', Central America, (1) a peninsula forming the southeastern boundary of the Gulf of Mexico and comprising the Mexican states of Yucatan and Campeche, British Honduras, and part of Guatemala. The combined area of the two states is 53,290 square miles; with British Honduras, 60,852 square miles. The capitals of the states of Yucatan and Campeche are Merida and Campeche respectively, and among other towns on the peninsula are Sisal, Izamal, Valladolid, Tixcotob, Progreso, and Bacalar. The peninsula is a limestone plain of coralline formation, and, except for some ridges in the south and in the centre, it has no hills. It has little wood, except near the coast, and surface water is almost wholly absent, though underground water is abundant. The water stored in natural caverns is reached by means of steps cut in the rock, and the Maya Indians formerly excavated large storage basins, many of which have become hot-

beds of fevers. Some of the many rock caverns have been inhabited or used as refuges during periods of war or revolution. The climate is warm, and generally unhealthy. There are no minerals of importance. Some maize and rice are cultivated, but the principal vegetable product is henequen or sisal hemp. Logwood is a product of the forests. Salt is obtained on the coasts, and the fisheries are productive. Yucatan and the neighboring districts were the seat of ancient kingdoms of the Mayas, who were the most highly civilized of all the Central American aborigines, and whose descendants still form the bulk of the population. There are numerous splendid ruins of their ancient cities, notably those of Uxmal, 40 miles south of Merida, Izamal, east of Merida, and Chichen-Itza, southeast of Merida. The Spaniards first entered the country in 1506, and during 1527-43 they effected its conquest. (2) A northeastern state of Mexico with an area of 35,203 square miles.

Yucca, the name of a genus of shrubs with clustered ensiform leaves, belonging to the *Liliaceæ*, but also employed as a common name to designate the plants belonging to the entire botanical family of yuccas. This includes not only the genus *Yucca* but several other genera, as *Samuela*, *Clistoyucca*, *Hesperaloe*, etc. The species are chiefly found in the United States and Mexico, though some of them are distributed to many portions of the world. The best known species in the United States is *Yucca filamentosa*, or Adam's needle, which is found in cultivation as far north as New England, its clusters of large white, bell-shaped flowers making it a favorite in gardens. Until recently none of the species has been regarded as valuable commercially, though the coarse fibre of *Y. filamentosa*, called bear-grass, has long been used in a small way as tie material in the South. In Mexico, however, there are several species with larger leaves that have of late years been exploited for their fibre, which is becoming known as a rather coarse substitute for the better cordage fibres. *Yucca australis*, *Hesperaloe funifera*, and *Samuela carnerosana* especially are used in northern, eastern, and central Mexico for fibre, which is derived from the *cogolla* or central spike of unopened leaves, the *cogollas* first being steamed, and the individual leaves scraped with a dull-edged iron tool, upon a block of wood, and the fibre extracted. This coarse fibre is known as *palma istle*, *pita sylvestris*, *zamandoque*, etc. *Yucca* fibre is stiff, harsh, and brittle, and as prepared is not always of good color, and therefore can never take rank with the better known hard cordage fibres. (See *Fibre*.) *Yucca baccata* yields a fairly good fibre, and the parenchyma or pith, and the root possess detergent qualities, from which the name soap-plant has been derived. The sun-cured, whitish yellow inner leaves of *Yucca glauca* are used by the Arizona Indians for ornamental basketry, either entire or subdivided, and several other species are also employed in the domestic economy of North American Indian tribes for rude cordage, baskets, sandals, mats, etc.

A very remarkable feature in the yucca is its fertilization by the aid of any of several species of small whitish moths of the tinea genus *Pronuba*. The yucca flowers are so

YUCHEE—YUKON

shaped as to be impossible of fertilization, and no other insects attach themselves to this plant. The yucca moth gathers a quantity of pollen in its jaws, then lays an egg in the pistil, and stuffs the hole in which it is laid with pollen, thus fertilizing the ovary. The caterpillar develops in the fruit-pod, but does not seriously harm the plant. This extraordinary case of symbiosis was disclosed by C. V. Riley in 1872, and may be found fully related by him in the 'Fourth Annual Report' of the State entomologist of Missouri.

Yu'chee. See UCHEAN.

Yuga, yoo'gā, or Yooga, one of the periods into which the past history of the globe is divided in the chronology of the Hindus. There are four yugas: The Satya Yuga, containing 1,728,000 years; the Treta Yuga, 1,296,000; the Dwapara Yuga, 864,000 years; and the Kali Yuga, now in progress, which began about 3094 a. c., and which will extend to 432,000 years. Horace Hayman Wilson points out that these numbers originate in the descending arithmetical progressions of 4, 3, 2, 1, according to the notions of diminishing virtue in several ages applied to a cycle of 12,000 divine years, each equal to 360 years of mortals; and $12,000 \times 360 = 4,320,000$, the periods of the four yugas added together. See INDIA.

Yuit. The Eskimos of extreme northeastern Asia, from East Cape to a little beyond Plover Bay. They migrated from America probably in recent times, and in appearance, customs, and manners differ in no great degree from their Alaskan kinsmen. Their population is unknown.

Yukian (adjectival form of the Wintun *yuki*, "stranger," also "bad," "thieving"), a linguistic stock of North American Indians, consisting chiefly of the Ashochimi, Chumaya, Napa, Tatu, and Yuki tribes, which formerly occupied Round Valley and the area extending therefrom to the California coast. The Round Valley reservation was subsequently established to receive these and other tribes, and most of their representatives now reside thereon. The entire group numbers only a few hundred at most. The original home of the Ashochimi was near the present Healdsburg; the Chumaya occupied middle Eel River; the Napa, upper Napa Valley; the Tatu, Potter Valley; and the Yuki, Round Valley.

Yukon, yoo'kōn, North America, a large river, mainly in the United States Territory of Alaska, which rises as the Lewes in British Columbia, about lat. 59°, and after a tortuous north, west by south, and northwest course of 2,044 miles, flows into Bering Sea, on the southern shore of Norton Sound, through a many-channeled delta from 80 to 90 miles wide. The northernmost channel of the delta, the Aphoon Mouth, is the only one navigable. The main stream of the Yukon is formed at Fort Selkirk in 63°, by the junction of the Lewes and the Pelly, the former being constituted by the junction of the Big Salmon and Teslin flowing from Teslin Lake and draining a group of small lakes in the region around Mounts Landsowne and Lorne. From Fort Selkirk the Yukon flows northwest with many windings, passing through the Klondike gold-field, receiving from the right the Stewart River, and at

Dawson the Klondike, and from the left the White River, Sixty-Mile Creek, and Forty-Mile Creek. It enters Alaska in about 65° N., and continues its northwestern course until the Arctic Circle is reached, when at the abandoned Fort Yukon, it is joined on the right by the Porcupine River, bends suddenly, almost at right angles, and thenceforward has a general southwestern trend to its mouth.

The chief Alaskan tributaries of the Yukon are the Kozukuk on the right bank, and the Birch and Tanana on the left bank. Its whole course of 1,260 miles through Alaska is navigable by stern-wheel steamers, and beyond to Dawson in Canada; since the discovery of gold throughout the region in 1897 a regular summer service is maintained; the first impracticable obstruction to navigation is at the Grand Cañon, 1,866 miles from the mouth. In its lower course the Yukon is a broad, muddy stream flowing mostly through a marshy plain and for nearly nine months of the year, from October to June, frozen over; its upper course is through the grand scenery of narrow mountain valleys, and rocky gorges. The Yukon is the largest American river flowing into the Pacific; it is the 17th river of the world as to length, the seventh of the Western hemisphere, the fourth of the North American continent, and the third in the United States. This last assertion is based on its whole length of 2,044 miles, however, but taking only that portion which is in the United States, or Alaska, 1,260; it is the fifth river of our country, the Mississippi, Missouri, Arkansas, and Ohio rivers being longer. Its length in navigable miles is 2,036, there being but four rivers in the world with a greater capacity, the Amazon, the Mississippi, the Missouri, and the Saint Lawrence.

Yukon. The Yukon Territory is the most northwesterly of the political divisions of the Dominion of Canada. It embraces a large, roughly triangular area of country, measuring about 207,000 square miles, bounded on the south by British Columbia, on the west by Alaska, on the north by the Arctic ocean and on the northeast by the series of mountain ranges separating the Yukon and Mackenzie basins. The population in 1910 was about 8,000.

Topography.—The territory includes a mountainous belt on the northeast consisting of the Selwyn, Ogilvie, and Peel river ranges of mountains, all of which are usually classed in the Rocky Mountain System, and the great St. Elias range on the southwest. A number of peaks in the latter range, such as Mount St. Elias and Mount Logan, exceed 18,000 feet in height. The central part of the territory is a broken upland known as the Yukon plateau, a great tract of rolling country deeply trenched in all directions by the wide valleys of the present and preglacial drainage systems. Toward the Arctic ocean the plateau is replaced by a plain sloping easily down to sea-level.

The greater part of the Yukon Territory is drained by the Yukon river, the fourth largest river on the North American continent and one of the great rivers of the world. The Yukon is formed by the junction of the Lewes and Pelly, the former drawing most of its waters from the Coast Range and the latter from the mountains of the Rocky Mountain System. Other large tributaries of the upper Yukon are

YUKON

White river, a swift, turbid stream heading in the glaciers of the St. Elias Range, and the Stewart and Porcupine rivers, both of which enter it from the east. River steamers navigate the Yukon river throughout its whole length and also ascend the Lewes up to Whitehorse rapids, a total distance from tide-water of about 2,000 miles. The Pelly, Stewart and other tributaries are also navigable for some hundreds of miles above their junctions with the main stream.

Fauna and Flora.—The valley flats and the lower slopes of the hills and ridges throughout the Territory are more or less thickly forested while the uplands are bare. In the southern part of the Territory the forest ceases at an elevation of 4,000 feet above the sea. Going northward the tree line descends gradually and at the Arctic circle has an elevation of less than 2,000 feet above the sea. The principal forest trees are the white and black spruces (*Picea alba* and *P. nigra*), the aspen (*Populus tremuloides*), the balsam poplar (*Populus balsamifera*), the balsam fir (*Abies subalpina*), the black pine (*Pinus Murrayana*), and the birch (*Betula papyrifera*).

The larger animals of the district include the black and brown bear, the woodland and barren land caribou, the moose, at least two species of mountain sheep, the mountain goat, the timber wolf, the red fox, and the wolverine, lynx, and martin.

Climate.—The climate is severe. The winter season lasts from about the first of November until April. The rivers are usually frozen by the first of November and remain frozen until May, while the lakes are seldom free from ice before the first of June. During the winter season thaws are infrequent and the temperature usually ranges from zero to 40° F. below. Occasional dips to 60° F. below and one to 68.50° F. below have been recorded. The low temperatures are usually accompanied by a dry atmosphere and do not occasion much hardship. The summer season, lasting from the middle of May to the middle of September, is exceedingly pleasant, as the long clear days are never oppressively hot and the nights are always cool. The rainfall is light, the annual precipitation amounting to about 15 inches.

History.—The history of the Yukon Territory dates back only to the year 1840. In that year Mr. Robert Campbell, a fur trader in the employ of the Hudson Bay Company, crossed from the Liard, a tributary of the Mackenzie, and discovered and named the Pelly, one of the main branches of the Yukon. In 1843 the same explorer descended the Pelly to its junction with the Lewes and was thus the first trader to reach the upper Yukon. In 1846 Mr. J. Bell also in the employ of the Hudson Bay Company descended the Porcupine to the Yukon, and in the following year Fort Yukon was built at the confluence of the two streams. In 1849 Fort Selkirk was established at the junction of the Lewes and the Pelly. It was raided and burnt by the Coast Indians in 1852 and was never rebuilt. Fort Yukon was occupied until 1869, when its site was moved to be in Alaskan territory and it was abandoned, and a new fort was built at the upper Ramnarts of the Porcupine. In 1850 Campbell descended the Yukon from Fort Selkirk to Fort Yukon and proved its identity with the Kwikh-nak, the name by which the lower portion of the river was known to the Russians.

The fur traders were followed, after an interval of some years, by the prospector. The first gold seeker entered the country by the Chilkoot pass, through the Coast Range, in 1873. In 1881, bar-mining commenced on the Big Salmon river, and discoveries of productive bars on the Lewes, Pelly, and Stewart soon followed. The first discovery of coarse gold was made in 1886 on Forty-mile river and was followed by important finds on streams flowing into Sixty-mile river. The Sixty-mile streams were actively worked until the announcement, in 1896, of the discovery of astonishingly rich creeks in the Klondike district drew most of the miners away. In 1897-98 a stream of 30,000 adventurers, including people of all trades and callings, poured into the country, all heading for the Klondike.

The discovery of the Klondike gold fields completely changed conditions in the hitherto unorganized and almost unknown Yukon territory. The town of Dawson was built at the confluence of the Yukon and Klondike rivers, and soon superseded Forty-mile as the chief commercial centre. A local administration, with courts of justice and other organizations necessary to government, was quickly established. The demand for better transportation was met by the construction of a railway from tide-water at the head of Lynn canal to the foot of the Whitehorse rapids on the Lewes river, from which point communication with Dawson is maintained by a large fleet of well-equipped river steamers. Telegraphic communication was also established with the outside world, and roads were constructed up the valleys of most of the producing creeks.

Government.—The Territory is governed, at present, by a commissioner appointed by the Federal Government at Ottawa, assisted by a council of five appointed, and five elected members.

Industries.—**Placer mining.**—The development of the Territory has depended, so far, almost entirely on placer mining. The rich Klondike creeks have been worked continuously since 1897, and have yielded gold to the value of \$121,000,000. The yearly production reached its maximum in 1900, when it amounted to \$22,275,000. During the season of 1905, the yield had declined to about \$7,000,000. The dwindling production marks the gradual exhaustion of the phenomenally rich claims on the various creeks, but does not mean a corresponding decline in the mining industry as the amount of gravel handled has if anything increased in recent years. The decreased returns are due to the lower grade of the gravels mined. In the early days of the camp most of the work was done with pick and shovel. More economic methods such as dredging and hydraulicing, are now being introduced.

Outside the Klondike district, some placer mining is being done on the upper waters of the Stewart, on the south branch of the Big Salmon and on the headwaters of the Alsek and White rivers. A large proportion of the Territory is still unprospected.

Ore mining.—Ore mining follows placer mining in most mining camps, and such promises to be the case in the Yukon. Quartz veins carrying free gold have been found at several points in the Klondike district. An important copper belt occurs west of Whitehorse. Some development work has been done on a few of the claims and some rich ore, principally bornite, has been

YUKON GOLD FIELDS—YUMAN STOCK

shipped to outside smelters. Native copper, sometimes in large masses, occurs loose in many of the creeks at the head of White river, but has not been traced to its source. Numerous discoveries of quartz veins carrying high grade silver minerals have recently been made in the vicinity of Windy Arm, Tagish lake. Work is being actively prosecuted on some of these veins with very satisfactory results. Besides those mentioned, discoveries of ores of various kinds have been reported from nearly every section of the Territory.

Coal mining.—Seams of lignite coal of good quality occur at several points along the Yukon river, and a sufficient quantity is mined to supply the small local demand. Anthracite coal also occurs in the region southwest of Whitehorse but has not, so far, been worked.

Agriculture.—Experiments made during the past few years have shown that nearly all the common vegetables can be grown successfully in the Yukon valley, and there is every reason to believe that in the near future produce of this kind will be raised in sufficient quantity to supply the local market.

R. G. McCONNELL,
Geological Survey of Canada.

Yukon Gold Fields. See ALASKA; CAPE NOME; KLONDIKE.

Yulan, a Chinese tree. See MAGNOLIA.

Yule, yool, Sra Henry, British geographer and Orientalist: b. Inveresk, Midlothian, Scotland, 1 May 1820; d. London 30 Dec. 1889. He entered the East India Company's military college at Addiscombe in 1837, in 1840 was appointed to the Bengal Engineers, and in 1855 became under-secretary to the public works department. In 1858 he published a 'Narrative of the Mission to the Court of Ava in 1855.' He left India in 1862 and in 1864 took up his residence at Palermo, Sicily, in order to continue and extend the researches which led to the publication of his great work, 'The Book of Sir Marco Polo, the Venetian, Concerning the Kingdoms and Marvels of the East,' newly translated and edited, with notes, etc. (1871, enlarged ed 1875). In 1875 he returned to England, and from that year till 1889 was a member of the Indian Council. His great work gained him the founder's medal of the Royal Geological Society. His other works include: a treatise in 'Fortification,' which was used as a text-book; 'Cathay and the Way Thither' (1866); 'Notes on Hwen Thsang's Account of the Principalities of Tokharistan' (1872); 'Hobson-Jobson: a Glossary of Anglo-Indian Colloquial Words and Phrases, and of Kindred Terms, etc.' (1886), with A. C. Burnell; 'The Diary of William Hedges' (1887-9), edited for the Hakluyt Society, of which he was for many years president.

Yule, the old English name for Christmas, still used provincially. See CHRISTMAS.

Yu'lee, David Levy, American politician: b. West Indies 1811; d. New York 1886. In boyhood he came with his father, whose name was Levy, to Richmond, Va., where he was educated. Sent to Florida in 1824, he there studied law, and being elected to Congress from that territory, served from 1841 to 1845, changing his name at this time from David Levy to David Yulee. He was United States senator from Florida 1845-51, taking a prominent part

in senatorial debates, and again 1855-61, when he resigned on account of the Civil War. He was then made a member of the Confederate Congress. After the war he became president of the Atlantic & Gulf Railroad, and was interested in the commercial development of Fernandina and Cedar Keys, Fla.

Yuma, yoo'ma, Ariz., city, county-seat of Yuma County; on the Colorado River, and on the Southern Pacific Railroad; 150 miles southwest of Phoenix. It is in a mining region in which there are considerable productive farm lands on which are raised grains and fruits. There is one bank, four churches, and graded public schools. Pop. (1890) 1,773; (1900) 1,402; (1910 est.) 1,500.

Yuman Stock, an important family or linguistic stock of North American Indians, the tribes composing it being scattered from the Colorado River region of Northern Arizona to the southern extremity of Lower California and even to the Mexican State of Sonora. The most important tribes of the stock are the Cochimi, Cocopa, Comeya, Cuchan, Diegueño, Havesupai, Maricopa, Mohave, Yavapai, Pericu, Seri, Tonto, Waikuru, and Walapai.

Of these, the Maricopa, or Coco-Maricopa, formerly inhabited the region around the confluence of the Gila and Colorado rivers. Their descendants and the Pimas, with whom they subsequently confederated, are now to be found in the Gila River Reservation to the number of about 400. They were an agricultural people and raised large crops by irrigation. Under missionary influence they have been civilized and are now noted for their industry, their efforts at self-improvement, and their manufactures of cotton cloth, baskets, and pottery.

The Seri Indians (Opata, "Spry") speak a distinct language and live on Tiburn island, in the Gulf of California, and the adjacent mainland of Sonora, Mexico. Their houses are flimsy bowers of cactus and shrubbery, sometimes rudely shingled with turtle shells and sponges. They make graceful balsas of canes lashed together for use in navigating the strait between their island and the mainland. They also manufacture a very light pottery and some basketry. The modern Seris are loosely organized in a number of maternal groups or clans in which polygamy prevails. They manifest implacable hatred toward aliens whether Caucasian or Indian and regard the shedding of alien blood as a great virtue. The population of the tribe was formerly several thousands but by constant warfare this number has been reduced to barely 350.

The name Tonto (Spanish, "foolish") has been inappropriately applied by the Spanish colonists of Arizona in the 19th century to a number of Indian tribes, namely: (1) To the Tulkepaia, a tribe of the Yuman stock settled in 1875 on San Carlos reservation, Arizona. (2) To the Eoyotero Apaches, an Athapascan tribe. (3) To the Pinal Apaches of the same stock. (4) To a mixture of Yavakai (Yuman) men and Pinal women who have intermarried. The name has been especially applied to the last mentioned body, who formerly occupied Tonto Basin and the Pinal Mountains of central Arizona, whence some 500 of them were removed to the Rio Verde reservation and later to the San Carlos reservation. They number about

700, and speak a mixed Yuman-Athapascan language.

The Mohave Indians reside in Arizona and California in the region of the Colorado River. There are upward of 2,000 Mohaves remaining, 600 of whom live on the Colorado River Reservation in Arizona. They are an agricultural people, rank high physically and are expert makers of pottery and baskets. They practise tattooing and cremate their dead.

The Yuma reside in the valley of the lower Colorado River in Arizona and California. Population, 655.

The Cochimi were formerly the most populous of the tribes of Lower California but only a few are now extant. They lived mainly about Loreto Mission.

The Cocopa formerly occupied the valley of the Colorado River up to the Gila junction, but the remaining 500 now live mostly in Mexican territory.

The Havesupai, numbering about 200, occupy the gorge of Cataract Creek, a branch of the Colorado River, in northwestern Arizona.

The Mohave Yavapai left the main tribe in the Colorado valley and migrated to the Rio Santa Maria district, in 1873 were removed to the Camp Verde agency, but since 1875 have been under the San Carlos agency.

The Walapai originally occupied the territory above the Mohaves on the Colorado River.

The total number, 20,000, who originally inhabited the United States has been greatly depleted and at present there are not more than 6,000 living within the limits of the United States.

Yung Wing, *yoong'wing'*, Chinese diplomatist and scholar: b. Nan Ping, province of Kwang Tung, 17 Nov. 1828. After graduation from Yale in 1854, he was in the silk and tea trade until 1864, and then entered the governmental service of China. The China Steam-navigation Company was established on his initiative, as was also the Chinese Educational Mission, for the education of Chinese in America. Yung Wing was made chief commissioner of this enterprise, for which an appropriation of \$1,500,000 was made. He was granted the rank of mandarin of the second grade, and appointed intendant of Kiang-Su province; and was for some time associate-minister to the United States, where he took up his residence in 1902.

Yunnan, *yün-nân'*, China, the most south-westerly province of the empire bordering on Tonkin and Burma; area, about 146,680 square miles. It is very mountainous in the north and west, and has a general slope toward the southeast. The central part is a plateau about 6,500 feet above sea-level, dotted with lakes and diversified by hills of red sandstone; but in the south the elevation of the land is much less. The province is traversed by several large rivers, principally the upper courses of the Yang-tse-kiang (called Kin-cha-kiang), the Si-kiang, the Song-ka or Red River, the Mekong, and the Salwin, but only the Song-ka can be regarded as of use for navigation within the province. The principal crops are rice, opium, and wheat, but tea, indigo, sugar-cane, cotton, earth-nuts, and many vegetables also are cultivated. Cattle, sheep, hogs, and other animals are reared in considerable numbers, and silk-worm-rearing is also extensively carried on.

The chief wealth of the province, however, lies in its immense mineral resources, which include iron, coal, copper, gold, silver, lead, tin, zinc, cinnabar, and precious stones. The manufacturing industries include the making of silk goods and other textiles, leather goods, etc. The climate varies from the rigor of the northern districts, where the mountains are snow-capped for the greater part of the year, to the comparatively tropical condition of the southeast. A large part of the population consists of Miao-tse and other non-Chinese elements, and Mohammedanism has many adherents. Yunnan, the capital, in the southeast, is a busy and prosperous town, with large copper factories, and manufactures of silks and carpets. (Pop. 200,000.) Other towns are Chaotung, Tali-fu, Momein, Lingnan-fu, Puerh, Tung-chwan, Mengtse, and Ssumao, the last two being open to foreign trade since 1889 and 1897 respectively. The British have endeavored to establish a direct trade route between Yunnan and Burma, but from the physical features of the region this is not easy. The history of Yunnan can be traced back to the 3d century A.C. Owing to its distance from the seat of the central authority and its mountainous character this province long remained practically independent. The most noteworthy event of its recent history is the great Panthay revolt of 1855, which was not suppressed by the Chinese authorities till 1873. Pop. estimated at 12,324,574.

Yupanqui Pachacuti, *yoo-pân'kê pâ-châ-koo'tê*, or Pachacutac Yupanqui, Peruvian Inca: b. about 1380; d. about 1440. He was the ninth ruler of the Inca line of sovereigns, and one of the greatest. He was the second son of the Inca Viracocha and after deposing or superseding his imbecile elder brother, Urco, he defeated the Chancas in a great battle, annexed their territory to his own and continued his successful career till the Inca kingdom included nearly all of what is now the republic of Peru. In order to relieve the congested condition of Peru he developed a system of colonies called mitimaes. Yupanqui figures largely in Quechua tradition and various national institutions have been traced to him.

Yu'rok. See WEITSPEKAN INDIANS.

Yuruary, *yoo-roo-â'rê*, a river of Venezuela, rising to the east of the Caroni and flowing eastward to join the Cuyuni in about lon. 61½° W., near the frontier of British Guiana. It gives its name to the Yuruary territory claimed by both Venezuela and Great Britain until 1899, when the award of an arbitration court gave most of it to Venezuela. There are several gold-fields here, including El Callao, etc.

Yuracares, *yoo-roo-kî-râs'*, or Yuracare, Indians of Bolivia occupying the forest plains on the eastern slope of the Andes between the rivers Mamore and Beni. They include several tribes, are tall and shapely, and are almost white. They are hunters and warriors for the most part and their mythology is intricate and confused. Prior to the expulsion of the Jesuits, in 1767, numbers of them were attached to the Chiquito missions.

Yusuf, *yoo's'uf*, or Yussuf, Abu Amru, Arabic historian: b. Cordova 976; d. Xativa 1070. He was profoundly versed in the tradi-

YUSUF—YVON

tions of the Oriental Mussulman countries and wrote: 'Behedjet-Almodjalsyn,' a collection of tales relating to Mohammed, etc.; 'Tamhyd,' a commentary on one of the chief Mussulman works of religious and civil law; 'History of the Opinions and Doctrines of the Principal Mussulman Sects'; 'History of the Wars Against the Christians'; etc.

Yusuf, or **Yussuf-Ben-Taxfy**, yoo's'uf-bën-tāsh-fën', Moorish prince: b. Velad Sahara; d. 1106. He was the second prince of the Almoravide line and in 1086 aided the Emir of Seville, Al-Mo'tamid, to gain the victory over Alfonso VI. at Zalaca near Badajos. In 1090 he again invaded Spain, at the call of the emir of Seville, and taking advantage of Mohammedan dissensions gradually acquired the sovereignty of the kingdoms of Malaga, Grenada, Murcia, Cordova, Seville, Almeria, Badajoz, and Valencia, which he united to the kingdom of Morocco. Notwithstanding his power, Yusuf never assumed a higher title than that of emir, and in 1103 his son Ali was acknowledged heir of both his Spanish and Moorish possessions. Consult Freeman, 'History and Conquests of the Saracens' (1856); Yonge, 'Story of the Christians and Moors in Spain' (1878); Coppée, 'History of the Conquest of Spain by the Arab-Moors' (1881).

Yverdon, è-vër'dôn (German, *Ifferten*), Switzerland, a town in the canton of Vaud, at the southwestern extremity of Lake Neuchâtel. Its castle, built in 1135, was used by Pestalozzi (q.v.) as an educational establishment in 1805-25, and now contains a library and museum. The town has also a fine town-house, a hospital, and a memorial of Pestalozzi; and among the manufactures are railway wagons and materials, beer, etc. The town has also an extensive system of wharves. Yverdon was the *Eborodunum* of the Romans, and there are remains of the ancient walls. Pop. about 8,300, mostly French-speaking Protestants.

Yves D'Evreux, èv dāv-re, **Pierre**, Franco-Brazilian historian: b. Evreux, Normandy, France, about 1577; d. after 1620. He became

a member of the Capuchin order in 1595 and was sent in 1612 with four missionaries as their superior, to Maranhao, Brazil, where a French colony had been established. He returned in 1614 and wrote: 'History of the Most Memorable Things that Happened at Maranhao in the Years 1613 and 1614' (Paris, 1615; 2d ed. 1864), a continuation of the history of Claude d'Abbeville, a work of great historical value.

Yvetot, èv-tô, France, a town in the department of Seine-Inférieure, on an elevated plain, 23 miles northwest of Rouen. It has manufactures of calico, hosiery, linen, leather, and baskets. Antiquaries have been much puzzled by an ancient chronicle, and still earlier edict, which gave the title of king to the lords of Yvetot. This edict was formally abrogated in 1681. 'Le Roi d'Yvetot,' the well-known song by Béranger, translated by Thackeray, was a satire on Napoleon, which has immortalized the ancient dignity.

Yvon, è-vôn, **Adolphe**, French historical painter: b. Eschwiller, Moselle, 1 Feb. 1817; d. Paris 11 Sept. 1893. He studied under Paul Delaroche, traveled in Russia in 1843, and brought back with him a series of designs exhibited in Paris in 1847-8. He obtained the medal of honor at the Salon of 1857, 10 years later became an officer of the Legion of Honor and was professor of drawing at the Ecole des Beaux Arts, Paris. In 1855 he was commissioned by the French government to accompany the army to the Crimea. Among his most important works are: 'The Remorse of Judas' (1846); 'The Battle of Kolikova' (1850); 'The First Consul Descending the Alps' (1853); 'Marshal Ney Supporting the Rear Guard in Russia' (1855); 'The Seven Deadly Sins,' designed after Dante (1855); 'The Capture of the Malakoff' (1859); 'Battle of Solferino' (1861); and an allegorical picture of 'The United States of America' (1870), executed for A. T. Stewart. He was an artist of remarkable power and holds a prominent place among the historical painters of France.

Z

Z the twenty-sixth of the letters of the English alphabet, is a vocal or sonant consonant, as distinguished from *s*, which is the corresponding fricative sibilant. It was adopted into the Latin from the Greek alphabet in the time of Cicero: in the Latin alphabet, as in our own, it holds the last place; but in the Greek its place is sixth, and in the Phœnician, Hebrew, and other Semitic alphabets seventh. In German and Italian it represents the sound of *ts*, in our language and in French it represents one simple sound. In Latin it was used only in words derived from the Greek. The exact value of zeta in Greek is not known with certainty; but beyond any question it stood for a double sound, not a simple sound like our *s*; this is conclusively inferred from Aristotle's remark that *xi* (ξ), *psi* (ψ), and *zeta* (ζ) are like in sound; and the inference is strengthened by the fact that in Greek prosody a vowel short by nature is made long by position when it occurs next before the zeta. The sound of the zeta, however, is in doubt—whether it was *ds* or *sd* or both. The name of Z in Great Britain is *zed*, in the United States *zee*. Though *s* is the alphabetic representative of the sonant sibilant, the special *s*-sound is in English oftener represented by *s* than by *z*.

Z-Bars. See RAILS AND STRUCTURAL SHAPES.

Zabians, a term not identical with Sabæans, but properly meaning certain non-Christian Gnostics, predecessors of the peculiar sect called Mandæans, still surviving in South Babylonia. The Cyrian Zabians were the survivors of the ancient Syrian heathen who, being under Mohammedan rule, took the name of Zabians in order to share the toleration which the followers of Mohammed extended to the real Zabians. This sect became extinct about the 12th century. See MANDÆANS.

Zacatecas, tsā-kā-tā'kās, Mexico, a state bounded by Coahuila, San Luis Potosi, Aguascalientes, and Durango. See MEXICO—THE STATES OF.

Zacatecas, Mexico, capital of the state of Zacatecas; 439 miles from Mexico City and 785 miles from El Paso Texas; elevation 8,044 feet above sea-level. The situation of the city, in a narrow and deep ravine, is most picturesque, surrounded and closely abutted on three sides by mountains or high hills. It is surrounded by a chain of mines many of which are among the oldest in the Republic and have produced enormous quantities of precious metals. Not all these are now worked, a number having seemingly become exhausted in so far as satisfactory returns are concerned. The Banco de Zacatecas, with \$1,000,000 capital, to-

gether with a branch of the National Bank, and an agency of the Bank of London and Mexico, supply the monetary demands of the community. A public library containing some 20,000 volumes is maintained by the local government. The most notable buildings are the historic old Cathedral, with its front wall a mass of artistic carving, and the Theatre, a very imposing structure of modern design. In the heart of the city is the Market House, an iron building admirably adapted to its uses and of pleasing appearance. A few minutes' ride southward toward a broad valley brings the visitor to the little village of Guadalupe, where there is a Chapel of Gold, built by a devout woman and ornamented throughout in solid gold gilt at great cost, estimated by some to have been not less than \$1,000,000. Here, also, is located the State Industrial School for poor boys,—a most interesting and creditable charity, in which shoe-making, tailoring, cabinet-making, and other trades are taught, together with the rudiments of a common school education. There are The School of Arts, The Juarez School and several other educational institutions of merit; the Civil Hospital, and two theatres,—the Gonzalez and the Calderon. Pop. about 40,000.

Zacharia, tsā-ha-rē'ā, Heinrich Albert, German publicist: b. Herbsleben, Saxe-Gotha, 20 Nov. 1806; d. Kannstadt 29 April 1875. He was graduated from the University of Göttingen in 1829, was lecturer there in 1835-42, and in 1842 became professor of law. He took active part in the political movement of 1848 as a member of the National Parliament; in 1866 he opposed annexation to Prussia; and in 1867 took a leading part in the convention which framed the constitution of the North German Confederacy. He wrote: 'German States' Rights and Federal Rights' (1841); 'Manual of German Criminal Procedure' (1860); 'German Constitutional Laws of the Present Time' (1855); 'The Question of the Competence of the Empire in View of the Dogma of Infallibility.'

Zacharia, tsā-ha-rē'ā, Just Friedrich Wilhelm, German poet: b. Frankenhausen 1 May 1726; d. Brunswick 30 Jan. 1777. After studying at Leipzig and Göttingen he became professor of belles-lettres in the Carolinum, Brunswick, and in 1761 at Halle. He wrote: 'Der Rennomist' (The Brawler) (1744), the first burlesque heroic poem that had appeared in German; 'Fables and Tales' (1771), etc.: and translated into German hexameters Milton's 'Paradise Lost' (1760).

Zacharia von Lingenthal, lng'ēn-tāl (Karl Eduard, German writer on jurisprudence. b. Heidelberg 21 Dec. 1812; d. Grosskmehlen,

ZACHARIAH—ZAHN

near Merseburg, 3 June 1894. He is regarded as the founder of the science of Græco-Roman jurisprudence. His works include: 'Outline of a History of Græco-Roman Jurisprudence' (1839); 'History of Græco-Roman Private Right' (1864); 'Græco-Roman Laws' (1856-84); 'Paralipomena ad Basilica' (1893); and an edition of Justinian's 'Novellæ' (1881-91).

Zachariä von Lingenthal, Karl Salomo, German jurist: b. Meissen, Saxony, 14 Sept. 1769; d. 27 March 1843. He studied at Leipsic and Wittenberg, was professor of law at the latter university, 1797-1807, and filled the same position at Heidelberg, 1807-43. He wrote: 'The Unity of State and Church' (1797); 'Forty Books on the State' (2d ed. 7 vols., 1839-43); 'Hand-Book of French Civil Law' (8th ed. 1894-5); etc.

Zacharias, zâk-a-rî'as, father of Saint John the Baptist, and husband of Saint Elizabeth. He was a priest of the temple of Jerusalem, and was stricken dumb on refusing to believe the announcement, made by the angel Gabriel, that a son should be born unto him; but recovered his speech at the birth of Saint John the Baptist. He is supposed to have been put to death by Herod (Luke i. 5-79).

Zacharias, or Zachary, Saint, pope: of Greek birth; d. Rome 14 March 752. He succeeded Saint Gregory III. in the papal chair in 741 and at his death was followed by Stephen II. He exercised a powerful influence over several of the Lombard kings, obtaining the restoration of various cities and territories which had formerly been subject to the papacy, and gave his consent to the setting aside of the Merovingian Childeric III. and the elevation of Pepin the Short to the French throne (752).

Zacharias. See ZACHARIAH.

Zacher, tsân'ér, Ernst Julius August, German philologist: b. Obernigk, Silesia, 15 Feb. 1816; d. Halle 23 March 1887. He was educated at Berlin and Breslau and was professor of German philology in Halle 1856-9, and 1863-87. His works, which are greatly prized by students, include: 'Ulfilas' Gothic Alphabet and the Runic Alphabet' (1855); 'German Proverbs' (1852); 'History of the Palgrave Geneveva' (1860); 'Pseudo - Callisthenes' (1867), dealing with the Alexander myth, etc.

Zack. See KEATS, GWENDOLINE.

Zacynthus, zâ-kîn'thûs. See ZANTZ.

Zadkiel, zâd'kî-él, (1) According to Jewish legend the angel of the planet Jupiter. (2) A pseudonym adopted by William Lilly (b. 1602; d. 1681), the astrologer. (3) The name assumed by Richard James Morrison (b. 1794; d. 5 Feb. 1874), compiler of an astrological almanac, begun by him in 1830, and which reached an annual sale of from 100,000 to 200,000 copies.

Zadok, zâ'dök, (1) A high priest of Israel, contemporary with David. (See SADDUCEES.) (2) A personage in Dryden's 'Absalom and Achitophel,' intended as a portrayal of Archbishop Sancroft.

Zâ'farin Islands, a group of three islands lying off the coast of Morocco, near the Algerian frontier. They are at the mouth of the Mulya River and shelter its harbor. They have belonged to Spain since 1848. The central island is fortified.

Zaffre, in chemistry, an impure oxide of cobalt containing some arsenic and made by roasting speiss cobalt. Used in place of smalt in painting on cheap glass and porcelain ware.

Zagazig, zâ-ga-zêg', or **Zakazik**, Egypt, the chief town of the province of Sharkieh, in the delta of the Nile, on the Muizz and Fresh-water canals, connected by rail with Cairo, Alexandria, and Suez, 40 miles north-northeast of Cairo. The great number of factories, with their tall chimneys, and the structure of the houses, give the place a European appearance, and testify to the industrial activity which prevails. Nearly all the cotton grown in the eastern Delta is sent here to be cleaned, sorted, and partly spun before being put on the market. The town is also a centre of the grain trade, and has rapidly increased in prosperity and population since its connection with Suez by the Fresh-water Canal. The excavated ruins of ancient Bubastis are in the vicinity. Pop. about 38,000.

Zagoskin, zâ-gôs'kîn, Mikhail Nikolaievitch, Russian author: b. government of Penza 1789; d. Moscow 1852. For some time he held a post in the department of mines at St. Petersburg. His comedy, 'The Scapegrace,' was praised by Prince Tschakovski, a dramatist of influence, and he wrote a number of others which had some success but were deficient in originality. His efforts in the domain of historical fiction, with Scott as a guide, were more worthy, the chief being 'Yuri Miloslavski' (1829). There were half a score of others, their subjects derived from Russian history or legend. Their patriotic quality assured them an audience on their first appearance, and that they do not yet lack for readers is shown by the commencement of a complete edition of his works in 1898. There is a Russian biography by Aksakov in an edition of selected works published in 1858.

Zahn, zâm, John Augustus, American educator: b. New Lexington, Perry County, Ohio, 14 June 1851. He was graduated at Notre Dame University in 1871 and entered the Order of the Holy Cross the same year. Appointed to the charge of the scientific department of Notre Dame in 1874, he became director in 1875, and vice-principal and director of studies in 1876. He has been provincial of the Order of the Holy Cross since 1897, has lectured extensively, and is known as an advanced evolutionist. His publications include: 'Evolution and Dogma'; 'Sound and Music'; 'Catholic Science and Catholic Scientists'; 'Scientific Theory and Catholic Doctrine'; 'Science and the Church'; etc.

Zahn, tsân, Johann Karl Wilhelm, German architect, painter, and art critic: b. Rodenberg Schaumburg, 21 Aug. 1800; d. Berlin 22 Aug. 1871. He became professor in the Academy of Arts, Berlin, 1829, and among his writings were: 'The Most Beautiful Ornaments and the Most Notable Pictures from Pompeii, Herculaneum, and Stabie' (1828-30); 'Ornaments of All Classical Periods of Art' (1832-9).

Zahn, Theodor, German theologian: b. Mörs, Prussia, 10 Oct. 1838. After studying at Basel, Erlangen, and Berlin he became professor of theology in the University of Göttingen in 1871. He filled a similar chair at Kiel

ZÄHRINGEN — ZAMBALES

in 1877, at Erlangen in 1878, at Leipsic in 1888 and in 1892 returned to Erlangen. Among his works may be named: 'Marcellus of Ancyra' (1867); 'The Shepherd of Hermas' (1868); 'Ignatius of Antioch' (1873); 'The Acts of St. John' (1880); 'Cyprian of Antioch and the German Story of Faust' (1882); 'Researches into the History of the New Testament Canon' (1881-93); 'The Gospel of Peter' (1893); 'Introduction to the New Testament' (1897).

Zähringen, tsä'ring-ën, the house from which the reigning grand-ducal family of Baden (q.v.), Germany, takes its origin. The name is derived from the castle of Zähringen, now in ruins, in the village of that name, about two miles north of Freiburg in Baden. The founders of the family were from the 8th to the 10th century Counts of Breisgau, but the history of the house really begins with Duke Bertold I., "the Bearded," who began to rule in the first third of the 11th century.

Zaira, zä-ä-rä, Africa, a name given to the Kongo River in part of its lower course.

Zakariä, zä-kä-zäk', Egypt. See ZAGARIA.

Zaleski, zä-lës'ki, Bohdan, Polish poet: b. Bohaterka in the Ukraine 14 Feb. 1802; d. Villepreux, near Paris, 31 March 1886. He studied at Warsaw and being obliged to leave his country after the revolution of 1830, he went to France. Many of his poems depict in the most vivid manner the scenery of Poland. His chief works are: 'The Spirit of the Steppes' (1842); 'The Most Holy Family'; and collections of shorter poems.

Zaleucus, zä-lä'küa, the legendary law-giver to the Epizephyrian Locrians, the Greeks who colonized Magna Græcia, the southwest extremity of Italy. He is supposed to have flourished in the middle of the 7th century B.C. and his code is said to have comprised the first written laws of the Greeks. According to tradition his laws were exceedingly severe.

Zalinski, zä-lin'ski, Edmund, "LOUIS GRAY," American soldier and inventor: b. Kurnich, Prussian Poland, 13 Dec. 1849. Coming to the United States in 1853 with his parents, who settled at Seneca Falls, N. Y., he was educated at the Syracuse High School, and entered the army in 1864 as volunteer aid on the staff of Gen. N. A. Miles. He was appointed second lieutenant 5th United States Artillery in 1866, and captain in 1887. He was professor of military science at the Massachusetts Institute of Technology 1872-6, and was graduated in 1880 from the United States Artillery School at Fort Monroe and the School of Submarine Mining at Willett's Point, N. Y. From 1883 to 1889 he devoted himself to the development and perfecting of a pneumatic dynamite torpedo gun. Among his inventions are an intrenching tool, a ramrod bayonet, a telescopic sight for artillery and a system of range and position finding for sea-coast and artillery firing. He retired from active service in 1894. See ORDNANCE.

Zalinski Gun. See ORDNANCE.

Zalokos'tas, Georgios, Greek poet: b. Syrrhako, Epirus, 17 April 1805; d. Athens 3 Sept. 1858. An ardent patriot, at 16 he fought in the insurrection at Missolonghi. Greek children are taught his songs, and among his best-known poems are: 'Missolonghi'; 'Armatoles

and Klepts'; 'The Entrance of Prevesa'; 'Hours of Leisure'; 'Marco Botzaris'; etc. Several of his verses have been translated into Italian, Spanish, English, German, French, and Russian. His 'Poetical Works' were published at Athens in 1860.

Zabaki, zä loos'kë, Josef Andrezej, Polish prelate and scholar: b. Poland 1702; d. 9 Jan. 1774. After serving for three years at Rome as ambassador to Pope Clement XII. he was made bishop of Kiev, but was banished to Kaluga for his opposition to the Dissidents. He is chiefly remembered for the service he did in awakening Polish literature. He spent his fortune in collecting a great library, which he bequeathed to Poland, but which was taken by Russia after the partition, and formed the nucleus of the Imperial Public Library.

Zama, zä'mä, North Africa, the name of two ancient cities about 30 miles apart, 100 miles southwest of Carthage, now represented by Djama and Sidi Amor-Djedidi. Both claim to be the scene of the victory of Scipio Africanus over Hannibal, which decided the fate of Carthage 202 B.C. It led to an ignominious peace which closed the Second Punic War 201 B.C. The Romans lost about 2,000 killed and wounded, while the Carthaginians lost in killed and prisoners over 40,000.

Zamacola, thä-mä-kö'ës, Ednardo, Spanish artist: b. Bilbao, Vizcaya, 1842; d. Madrid 14 Jan. 1871. He was a pupil in Madrid of Balaca, Federico de Madrazo, and the Academy; in Paris of Meissonnier and the Beaux-Arts; and has been ranked as second to only Fortuny among Spanish genre-painters of the 19th century. His subjects were drawn largely from the 16th and 17th centuries, and frequently treated in a satirical vein. His technical finish has been described as "almost as perfect as Meissonnier's." Among his paintings are: 'The Hunchback'; 'Spanish Recruits'; 'The Bull Fighters'; 'Indirect Taxes'; 'A Court Jester of the 16th Century'; 'The King's Favorite' (1867); 'Cervantes as a Recruit'; 'The Rival Confessors' (1868); 'Return to the Convent' (1869); 'The Education of a Prince' (1870); 'The Puzzled Musician.' Very many of his works are in private collections in the United States.

Zambales, thäm-bä'läs, Philippines, a province of Luzon, in the southwestern part of northern Luzon; bounded on the west by the China Sea; on the north by Lingayén Gulf; on the east by Lingayén Gulf, and the provinces of Pangasinan, Tarlac, and Pampanga; and on the south by Bataan; length 120 miles; width, 28 miles in the southern part, 25 miles in the northern part, and 12 miles in the central part; area, 2,160 square miles; with dependent islands, 2,210 square miles. A chain of mountains near the eastern boundary parallels the coast; and there are also two groups of peaks but a few miles inland from the coast. There are numerous short rivers, and several thermal springs in the province. The chief industry of the province is agriculture; rice and wheat of superior quality are the special products; sugar, cotton, tobacco, and coffee are also extensively cultivated. Next to agriculture in importance is the raising of cattle, horses, carabaos, and hogs. The mechanical industries are very limited and primitive; copper and coal are mined; and there are

ZAMBEZI — ZAMBOANGA

indications of iron. The forest products are valuable, and amber is collected in considerable quantities on the coast. There are but few roads, and these are mostly impassable in the rainy season; a road and telegraph line parallel the coast for the greater part of the distance. Civil government was established in August 1901, and the provincial governor reported the province in a peaceful and prosperous condition in January 1902.

Zambesi, zām-bě-zě, or **Zambesi**, South Africa, a river rising in Portuguese West Africa, in lat. $11^{\circ} 21' 3''$ S., and lon. $24^{\circ} 22'$ E., and reaching the Indian Ocean at Chinde and Conceição in Portuguese East Africa, opposite Madagascar, after a total course of 1,650 miles, of which the middle part belongs wholly to Rhodesia. The Victoria Falls and the Kebrabasa Rapids, the former in the west of Rhodesia and the latter in Portuguese East Africa, above Tete, are regarded as dividing the river into three sections, the Upper, Middle, and Lower Zambesi. The neighborhood of the source has an altitude of about 5,000 feet, and the river has its origin in a deep depression at the base of steep undulations, where the water oozes from a black marshy bog and quickly collects into a well-defined stream. Another head-stream of the Zambesi is the Kabompo, which rises in the northwest of Rhodesia, about lat. $11^{\circ} 34'$ S., and lon. $25^{\circ} 17'$ E., also at an altitude of 5,000 feet, and in a region of open grassy downs. The former stream, at first known as Yambeshe and then as Liambai (Liambeshe), flows at first west with a southward trend, and then turns south-southeast. Ten miles of rapids precede the Sapuma cataracts ($13^{\circ} 7'$ S.), where the river flows "through a narrow rocky fissure into a pool of considerable extent." At about 14° S. it is joined by the Kabompo from the northeast and the remaining course of the Upper Zambesi has a south and southeasterly direction through the low-lying, grassy Marotse country, and is marked by various cataracts and rapids. Sesheki is a place of some importance on the left bank, near where the river begins to be wholly in British territory; and a short distance farther down, opposite Kazungula, it receives from the west the waters of the large tributary Kuanda. In about 18° S. there are the celebrated Victoria Falls (q.v.), discovered by Livingstone in 1855. Here the broad river suddenly plunges into a transverse chasm 400 feet deep amidst a scene of tremendous grandeur. The gorge just below and in full view of the falls is spanned since 1904 by a lofty bridge on the Cape to Cairo Railway. The Middle Zambesi, whose direction is east, northeast, and again east, receives the Guay-Shangani and San-yati from the south; the Kafukwe and Loangwa from the north, the latter at Zumbo, where the river leaves British territory; and is interrupted by various rapids and rocks, especially at low-water, the Kebrabasa Rapids being the first impassable obstacle to navigation from the mouth. The remaining course of the river (Lower Zambesi) has been described as, except for the Lupata Gorge, "merely a broad expanse of sand, three to five miles wide, with low, reed-fringed banks, and intersected by numerous shallow streams." It passes the town of Tete, below which it is joined on the right

by the Mazoe, and after passing Sena it receives from the left the Shiré from Lake Nyassa, the waterway to British Central Africa. It enters the Indian Ocean by several mouths, of which the Chinde one is the most practicable. The delta covers an area of about 25,000 square miles, and commences about 90 miles from the coast, a little below the confluence of the main stream with the Shiré. The river drains an area estimated at 600,000 square miles. Its basin is separated from that of the Orange River on the southwest by a slight watershed, and from that of the Limpopo on the south by a mountain range. The valley of the Zambesi is capable of immense development in the way of trade. The Portuguese government has long exercised sway for 300 miles from the mouths of the river, and by the international arrangement of June 1891 the river from the coast to the confluence of the Loangwa is recognized as being in Portuguese territory. The Zambesi and its affluents are now free to the flags of all nations. The Upper Zambesi was first explored by Livingstone, who reached the Liambai in 1851.

Zambesia, zām-bě-zhī-ā, one of the three districts of Portuguese East Africa, and a name popularly applied to the regions in Rhodesia divided by the Zambesi, and known respectively as North and South Zambesia. See EAST AFRICA, PORTUGUESE; RHODESIA.

Zamboanga, zhām-bō-ān'gā, Philippines, (1) town, capital of the comandancia of Zamboanga; on the southern coast, 17 miles across the strait from Isabela. It was founded in 1635 as a base of operations against Moro pirates; shortly before the American occupancy of the islands it was almost entirely destroyed by fire, partly by the Spaniards and partly by the Filipinos; since then it has been rebuilt. Many of the houses are of stone, and the town contains a fort, the Castle of San Felipe, a cathedral, and a public hospital. It is connected with Manila by steamer, and is the chief market in the southern part of the archipelago for hemp, copra, and gutta percha. (2) Comandancia of Mindanao, forming the western peninsula of that island; bounded on the north by Dapitan, on the south by the Celebes Sea and Basilan Strait, on the east by Cotabato, and on the west by the Sulu Sea; length from northeast to southwest 103 miles, and from east to west along the northern boundary 94 miles; area, 3,358 square miles; with dependent islands, 3,486 square miles. The main mountain range extends west and then southwest from the northeastern boundary; another range traverses the Bañganinan or Flecha peninsula. The climate is the best in the Philippines, the temperature varying but a few degrees. Agriculture and stock raising are the more important industries; rice, hemp, cotton, coffee, sugar, cocoanuts are cultivated; and cloves and nutmegs and vegetables are also among the valuable products of this province. Cattle, horses, and hogs are raised. There is an abundance of valuable woods, particularly teak and juniper; several saw mills, coconut mills, and small sugar mills are in operation, but the mechanical industries are almost entirely for supplying home demand. There are indications of coal and gold, but no mining. There are no roads except near the towns.

ZAMBONI'S PILE—ZAMORA

Zambo'ni's Pile, in electricity, a dry voltaic pile or battery invented by Zamboni. Paper silvered on one side is damped and coated on the other with manganese dioxide; half a dozen of these sheets being superposed to save time, disks are punched out, and 1,000 to 2,000 single sheets are compressed in a glass tube with metal caps and knobs at the ends. Such a pile will charge a Leyden jar, though it will not give shocks or sparks.

Zamia, a genus of *Cycadaceae*. (See CYCADAE.) In aspect the species partly resemble palms, and partly tree ferns; in affinity they are nearer the latter than the former, but rise considerably above them in organization. They are natives of tropical America, tropical Asia, the Cape of Good Hope, and Australia. *Z. caffra* is the bread-tree *Zamia*. It is six or seven feet high, and is a native of southeastern Africa, where the Kaffirs and the Hottentots make cakes of the pith after it has putrefied. *Z. spiralis* has many smooth leaflets, with a few spines at the tip. It grows in Australia, where the natives eat the fruit. The stems of *Z. tenuis* and *Z. furfuracea*, and the seeds of *Z. integrifolia* or *pumila*, in the West Indies, yield arrow-root. The Florida Indians call the last "coontie," and manufacture flour from the rhizomes. It grows in the everglades of Florida, and has large tubers of the shape and size of parsnips, which are rough and gray on the outside, but are white internally. The tubers are pounded to a pulp, in a log mortar, and washed in a straining cloth, the abundant starch of the coontie passing through and settling in a deerhide. This process rids the plant of an acrid poisonous principle which is carried away by the water. The Federal armies lost a number of men during the Civil War, who ate the root in its crude poisonous state. The sediment, or starch left in the deerskin after straining, is fermented and dried, and becomes a yellowish-white flour ready for use, which has long been a staple food of the Seminoles. The coontie starch, when extracted in proper mills, is finer and whiter than the Indian product, and is called Florida arrow-root. It is nutritious, and makes excellent puddings, and the like.

Zamojski, ză-moi'skê, an ancient family of Poland, whose most distinguished members have been JAN ZAMOJSKI, statesman and general (b. Skokow, palatinate of Chelm, 1 April 1541; d. near Skokow 3 July 1605). He was educated at Paris, Strasburg, and Padua, and in 1564 was elected rector of the university at Padua. In 1565 he returned to Poland, and upon the death of King Sigismund Augustus in 1572, succeeded in so organizing the equestrian order, that in the diet of 1573, held at Warsaw, Henry of Anjou (afterward Henry III. of France) was chosen king of Poland. Upon the abandonment of Poland by Henry, a party of nobles elected Maximilian II. of Austria, and he was proclaimed king by the primate; but the party hostile to the house of Austria chose Stephen Báthori (q.v.), who marched rapidly to Cracow, and was there crowned Zamojski, the leader of this movement, was made grand chancellor of the kingdom. In 1580, during the war with Russia, Báthori appointed him commander of the principal army, with the title of hetman; and in 1582 he negotiated the peace by which Livonia, Esthonia, and Novgorod were

ceded to Poland. After the death of Báthori in 1586, he might have secured the crown for himself; but he used his influence in favor of Sigismund III., son of the king of Sweden, defeated the army of the opposing claimant, the Archduke Maximilian, at Cracow, pursued him into Silesia, and took him and his forces prisoners. From 1590 to 1597 he was engaged in a constant series of wars; and while Sigismund, with whom he was no favorite, did not concern himself about the condition of the kingdom, he almost alone maintained the integrity of the state, fighting successfully against the Turks, Tartars, and Cossacks, and oftentimes supporting the army from his private fortune. Zamojski was not only a great statesman and general, but a munificent patron of literature and the sciences. He founded New Zamosc, which came to be regarded as one of the strongest fortresses of Poland, and established there an academy and a famous printing press. He wrote 'Testamentum Joannis Zamor' (1606), and many letters of his are to be found in Lunig's 'Literæ Procerum Europæ.' JAN ZAMOJSKI, general, grandson of the preceding (b. 1626; d. Warsaw 2 April 1664). He participated in the campaign of 1651 against the Cossacks, was made palatine of Sandomir, and was very conspicuous in the following wars. In 1659 he was at the head of the army which acted in the Ukraine against the czar of Russia. ANDRZEJ ZAMOJSKI, statesman (b. Biegun 1716; d. Zamosc 10 Feb. 1792). He entered the military service of Saxony, went back to Poland in 1754 and was made marshal of the palatinate of Smolensk. In 1760 he emancipated his serfs, and on the accession of Stanislas Augustus was appointed grand chancellor. In 1776, at the request of the diet, he drew up a code of laws, which was printed under the title of 'Zbiór praw sądowych' (1778). The liberal character of the code, especially its provision for a general measure of emancipation, aroused against it so great a hostility, that in the diet of 1780 it was not permitted to be read, but it was adopted in 1791. ANDRZEJ ZAMOJSKI, statesman, grandson of the preceding (b. 2 April 1800; d. Cracow 29 Oct. 1874). He studied at Geneva and Edinburgh, entered the Polish civil service in 1823 and was minister of the interior of the revolutionary government in 1831. He later introduced steam navigation on the Vistula, but as the head of an important agricultural association incurred the suspicion of the Russian government. The association was suppressed in 1862 and Zamojski banished.

Zamora, thā-mō'rā, Antonio de, Spanish dramatist: b. Madrid about 1660; d. there before 1744. He was a court officer during the reign of Philip V. and also held a secretaryship in the department of Indian affairs. He wrote a number of dramas which were highly esteemed by his contemporaries. He imitated the style of Calderon, but rarely attained the poetic beauty of that author; the best of his dramas, however, show skillful development of character. Among the most noteworthy are 'Mazariegos y Monsalves'; 'Cada uno es Linaje Aparte'; 'El hechizado por fuerza,' a comedy produced in Spain in modern times; and 'El Convidado de Piedra,' on which is based the libretto of the opera of 'Don Juan.'

ZAMORA — ZANESVILLE

Zamora y Coronado, z kô-rô-ná'thō, **Jose Maria**, Central American jurist: b. Cartago, Costa Rica, 1785; d. Cuba after 1846. He was educated in Spain and on his return from there held important judicial and civil posts in both Porto Rico and Cuba. He published 'Registro de la legislación ultramarina' (6 vols. 1844-8), a work of much historical value on account of its being a collection of laws and regulations pertaining to the Spanish-American colonies.

Zamora, Spain, a city in Leon, capital of a province of the same name, 140 miles northwest of Madrid, on a rocky hill on the right bank of the Douro, here crossed by a fine bridge. It has interesting mediæval buildings, and is the see of a bishop; the cathedral is a Gothic structure, completed about 1174, but partially modernized in the Corinthian and Doric styles. Zamora as a fortified town played an important part in early Spanish history, and is renowned for the successful defense which it made against the Moors in 939 A.D. Pop. about 18,000.

Zamora, Venezuela, an interior north-western state bounded by Lara, Miranda, Bolivar, and Los Andes. The capital is Guanare (q.v.). Area, 25,212 square miles. Pop. 246,676.

Zamosc, ză'mōsch, Russian Poland, a fortified town in the province of Lublin, on the Wieprz, 50 miles southeast of the town of Lublin. It was laid out in 1588 in the Italian style by Jan Zamojski, and all its houses have arcades. Its fine castle, the four churches, the arsenal, and the town-house are the chief buildings. The manufacture of furniture is the principal industry.

Zamouze, ză-moos', the West African buffalo (q.v.).

Zampa, zăn-pă, **Ou la Fiancée de Marbre**, an opera comique by the French composer, Louis Joseph Ferdinand Hérold (q.v.), first produced in 1831.

Zampieri, dzăm-pē-ă'rē, **Domenico**. See DOMENICHINO.

Zanardelli, Giuseppe, joo-sēp'pē dzā-nār-dē'lē, Italian statesman: b. Brescia 29 Oct. 1826. After study at Pavia, he was a volunteer in the war of 1848, then was for a time in journalism and gave lectures on law, but was forced by the Austrian officials to discontinue them. Elected deputy in 1859, he held various administrative posts, in 1876 became minister of public works, and in 1878 of the interior. From 1881 to 1883 he was minister of justice, and from 1887 to 1891 again held that portfolio. During the latter period of service he issued the penal code and commenced a reform in the magistracy. He was president of the Chamber of Deputies in 1892-4, in 1897 was again chosen, in December 1897 accepted the portfolio of justice for a third time, but withdrew in May 1898, once more to become president of the Chamber. This post, too, he relinquished, to identify himself with the opposition, and at the fall of the Saracco cabinet in February 1901 was able to form an administration with the aid of the extreme left. He was an orator of high rank, a steadfast Liberal, and the recognized leader of the constitutional left.

Zandeh, zăn'dă. See NYAM-NYAM.

Zane, zân, **Ebenezer**, American pioneer: b. Berkeley County, Va., 7 Oct. 1747; d. Wheeling, W. Va., 1811. Of Danish descent he made the first permanent settlement on the Ohio River in 1770, on the site of the present city of Wheeling, building there a block house called Fort Henry, whence he repelled several Indian assaults during the Revolutionary War. He was a disbursing officer under Lord Dunmore; held several military and civil offices, and attained the rank of colonel. The land where the city of Zanesville, Ohio, now stands, formed a portion of his property, and he assisted John McIntire in laying out that town in 1799. The locality was called by them Westbourn, and the present name was not adopted till 1802.

Zanella, Giacomo, jă'kō-mō dzā-nē'lā, Italian poet: b. Chiampo (Vicenza) 1820; d. Vicenza 17 May 1888. After studying for the priesthood at the Vicenza seminary, he became professor there of philosophy and Italian literature. Having held posts in lyceums at Venice, Vicenza, and Padua, he was made professor of Italian literature in the University of Padua in 1866, and in 1871-2 was rector of the university. His work is noted for beauty of style and mastery of form; his most popular poem being 'La Conchiglia Fossile' (The Fossil Shell). His first volume of poems, 'Verses,' appeared in 1868, and was followed by several others. Among his poetic tales are: 'The Little Calabrese' (1870), and 'Robin Redbreast' (1881). He published also some volumes of prose, including 'On Italian Literature in the Last Century' (1885).

Zanesville, Ohio, city, county-seat of Muskingum County, on the Muskingum River at the confluence of the Licking, and on the Baltimore & O., the Cincinnati & M. V., the Ohio & L. K. branch of the Baltimore & O., the Ohio River & W., the Wheeling & L. E., the Zanesville & W., and the Zanesville, M. & P. R.R.'s, and on the Columbus, Newark & Zanesville Interurban Electric Railroad. The town was originally founded by Jonathan Zane and John McIntire in 1799. The city is situated in the midst of a fertile agricultural region, and near the city are extensive deposits of coal, clay, and limestone.

Principal Buildings, etc.—The chief buildings include the New Masonic Temple, the People's Saving Bank building, Soldiers and Sailors' Monumental building, Schultz Opera House, Weller Opera House, County Court-house, Schultz office building, Zanesville High School, Clarendon Hotel building, and City Market House.

Manufactures.—Manufacturing began early in Zanesville, and was rapidly increased owing to the excellent water-power furnished by the Muskingum River, and the low price of fuel. The manufactures are varied and consist of the largest tile works in the world, potteries, agricultural implements, bent wood works, breweries, brick-yards, coffin factories, foundries, flouring mills, glass houses, leather tanneries, machine-shops, mining tool factory, tube works, and woolen mills, etc. The employment list numbers nearly 6,000 persons.

Banks, Churches, Schools, etc.—The city has four national banks, with a capital of \$650,000; there are also two state banks and seven savings banks; there are 31 churches, in-

cluding nearly all the leading denominations. There are 44 secret societies. The city has a very complete school system, there being 17 public schools, the Zanesville Business College, two Roman Catholic parochial schools, besides a high school, a Roman Catholic academy, and a Lutheran parochial school. The McIntire Children's Home was endowed by the estate of John McIntire.

Government, etc.—The organization of the city under the Ohio Code consists of a mayor, three members of the board of public service, who also constitute the board of health; two members of the board of public safety, appointed by the mayor; joint city and county board of workhouse directors, appointed by the mayor; and a police judge. The city has a municipal water plant and a municipal hospital. Pop. (1910) 28,026.

FLORENCE C. HYSEN,
Secretary Post-Office Executive Department,
Zanesville.

Zangwill, Israel, British author: b. London 1864. He was educated at the Jews' Free School (Spitalfields) and the University of London, published in 1888 'The Premier and the Painter,' a fantastic romance, in 1890 established 'Ariel, or the London Puck,' a brilliant but short-lived periodical, and soon made his reputation by his essays, works in fiction, and plays. His department of literary causerie, 'Without Prejudice,' in the 'Pall Mall Magazine,' became well known in Great Britain for its able critiques. Some of these essays were gathered into a volume of that title in 1896. Some of Zangwill's best fiction deals with Jewish types and subjects, as in 'Dreamers of the Ghetto' (1898), with its semi-historical pictures of Heine, Spinoza, Uriel (Gabriel) Acosta, and others. He lectured in Great Britain, Ireland, Palestine, Holland, and the United States, and, as a prominent Zionist, gave addresses in connection with that movement and the application to it of the Baron de Hirsch millions. His literary work is in a style of much distinction, with frequent touches of irony. Among his farther volumes are: 'Children of the Ghetto' (1892); 'Ghetto Tragedies' (1893); 'They That Walk in Darkness' (1899); 'The Mantle of Elijah' (1900); 'The Grey Wig' (1903); 'The Celibates' Club' (1904); and 'Blind Children' (1903), a collection of his verses. The play which he constructed (under the same title) from his 'Merely Mary Ann' (1893), was more successful (1904) than the dramatization (1899) of 'Children of the Ghetto' or the one-act 'The Moment of Death' (1900). 'Six Persons' (1892) was well received in England.

Zangwill, Louis, English author, brother of I. Zangwill (q.v.): b. Bristol 25 July 1869. At first a journalist he later took up literature as a profession, using for a while the pseudonym 'Z.Z.' He has published 'A Drama in Dutch' (1894); 'The World and a Man' (1896); 'The Beautiful Miss Brooke' (1897); 'A 19th Century Miracle' (1897); 'One's Woman' (1902); etc.

Zankoff, zân'kôf, Dragan, Bulgarian politician: b. Sistova 1827. He studied at the universities of Odessa, Kiev, and Vienna, and entering the service of Turkey, became secretary to the Pasha of Rustchuk, Bulgaria. In 1880 he was made premier of Bulgaria and minister

of foreign affairs by Prince Alexander, and again held the post of premier 1883-4. Later he became the enemy of Alexander and the head of the pro-Russian party. On the night of 20 Aug. 1886 Zankoff with a party of fellow-revolutionists broke into Prince Alexander's palace and forced him to resign. Zankoff then became a member of the provisional government.

Zanotti, dzâ-nô'ttê, or Cavazzoni Zanotti, Giovanni Pietro, jô-vân'nê pê-â'trô, Italian artist: b. Paris 1674; d. Cortona 1765. He was a pupil of Lorenzo Pasinelli at Bologna, and became a good designer and colorist, and an adept in chiaroscuro. For churches at Bologna he executed several altar-pieces, among the chief that of 'The Incredulity of St. Thomas' in the church of that saint. There is also in the Palazzo Pubblico a large picture by him of 'The Ambassadors of Rome Swearing Fidelity to the Bolognese.' At Cortona, where he long resided, he distinguished himself by such pictures for churches as 'Christ Appearing to Mary Magdalene' and 'Christ Carrying His Cross.' He was a careful writer on art, the most important of his works being the 'Storia dell' Accademia Clementina di Bologna' (1739).

Zante, zân'tê, or Zacynthus, Greece, one of the Ionian Islands, in the Mediterranean, between eight and ten miles south of Cephalonia, and 15 miles from the nearest point of Greece. It is about 24 miles long, 12 miles broad, and 60 miles in circuit; area, 277 square miles. It has the form of an irregular oblong, indented with a deep bay at its southeast extremity. The western half is hilly, rising to 2,500 feet, and the west coast exhibits limestone cliffs. The east coast has a harbor, within which is situated the town of Zante [pop. (1896) 14,906] a thriving and well-built place, the see of a Greek protopapas, and of a Roman Catholic bishop. Part of the island consists of an extensive fertile plain, having the appearance of one continued vineyard, with a few patches under cereals or pasture. The prevailing rocks are calcareous; gypsum appears in various parts, and its pitch-wells are famous. Earthquakes frequently occur. The staple export of Zante is currants. The other chief exports are oil, soap, and a little wine; pomegranates, melons, peaches, oranges, citrons, and other fruits are grown, but the corn raised scarcely supplies three months' consumption. Goats are the only live stock. The island forms a nomarchy of the kingdom of Greece, since 1864; it is mentioned by Homer, and was formerly an independent state which successively came under Macedonian, Roman, and finally Greek rule. Pop. about 50,000.

Zanza'liana. See JACOBITES.

Zanzibar, zân-zî-bâr', East Africa, (1) A former sultanate comprising the whole coast between Magdishu (Magadoxo), about lat. 2° N., and Cape Delgado, lat. 10° 42' S., with the four islands of Zanzibar, Pemba, Lamu, and Mafia. The continental part of the sultanate in 1890 was divided between British East Africa and German East Africa; while the island and town of Zanzibar, and the island of Pemba became a British protectorate; joint area 1,020 square miles; pop. est. 250,000. (2) The island of Zanzibar with an area of 600 square miles, is very fertile and well cultivated, being espe-

ZAPOLYA—ZAVALA

ially suited for the cultivation of cloves, sugar, coffee, cocoa, and various spices, of which there is a considerable export. The heterogeneous population estimated at 200,000 includes Europeans, Arabs, half-caste Portuguese from the Malabar coast of India, and the Suahilis from the mainland. (3) Zanzibar, the chief town (pop. 100,000) on the west side of the island, is the centre of trade for the eastern seaboard of Africa, and of missionary and exploring work for the interior.

Zapolya, zā'pōl'yō, John, king of Hungary: b. about 1487; d. 1540. After the death of Louis II. at Mohács (1526) he was elected king of Hungary by the National party, having previously been voivode, or prince, of Transylvania. The crown was contested by Ferdinand of Austria, who was at first so successful as to compel Zapolya to flee to Poland. But the latter, with Turkish assistance, by 1529 had subdued a great part of Hungary, together with the capital city of Buda, as well as Transylvania. The kingdom was divided between Zapolya and Ferdinand in 1538 by the treaty of Grosswardein.

Zappi, Giovanni Batista Felice, jō-vān'nē bā-tēstā fā-lē'chā zāp'pē, Italian poet: b. Imola 18 March 1667; d. Rome 30 Aug. 1719. After a legal training at Bologna, he went to Rome, where he gained a brilliant reputation as juriconsult and poet. He assisted in establishing the Academy of Arcadians, in which he held the name Tirsi Leucasio. His verse abounds in fantastic adornments. A collection of it appeared in 1776, and it has been otherwise published, both separately and in association with that of his Arcadian colleagues. He received the patronage of Pope Clement XI.

Zara, zā'rā, Ital. dzā'rā, Austria, a seaport town, capital of Dalmatia, on a promontory, which was converted into an island by cutting through the narrow isthmus which formerly connected it with the mainland, 70 miles northwest of Spalatro. It was a fortress till 1873, and still has four gates and mediæval ramparts, the latter now converted into a public promenade. It has steep and narrow streets; several squares; an ancient and interesting cathedral, in the Lombard style; several other churches; a town-house; a lyceum, gymnasium, archiepiscopal seminary, normal and other schools; a civil and a military hospital; and a capacious but somewhat shallow harbor, admitting warships of medium size. It has manufactures of rosoglio, maraschino, and glass, and some trade. Zara has stood many sieges, particularly one in 1202, when it was taken by the Venetian doge Dandolo, with the assistance of the French crusaders; and another in 1346, when it was taken by Marino Faliero in the face of a large Hungarian army. Pop. about 35,000.

Zarate, thār-ā'tā, Antonio Gil y, Spanish dramatic poet: b. San Lorenzo de l'Escorial, Spain, 1795; d. 1860. He was educated in Paris; and on his return to Spain became professor of physics in Granada. He afterward wrote dramas notable for striking situations, lively dialogue, and elegant versification; among them are: 'Blanche of Bourbon' (1835); 'Guzman the Brave'; 'The Czar Demetrius.' He also published a history of Spanish literature.

Zarate, Augustin de, Spanish historian: b. about 1492; d. Madrid about 1560. After holding for 15 years the office of comptroller of Castile he accompanied Nunez Vela, viceroy of Peru, to South America in 1543, and while there was not only an eye witness of many historical events of importance, but made a close study of Peru and its annals. On the fall of Gonzalo Pizarro he returned to Spain and in 1555 published 'Historia del descubrimiento y conquista de la provincia del Peru' (History of the Discovery and Conquest of the Province of Peru). There have been many later editions of this most valuable work, and it has been translated into French and Italian.

Zarathushtra, zā-rā-thoosh'trā. See Zoroaster.

Zar'atite, an emerald-green incrustation usually on chromite. It is a hydrous basic carbonate of nickel. Its best known locality is at Texas, Pennsylvania. It is often called "emerald nickel."

Zarso'ba. See ZERIBA.

Zarits'in, Russia. See TSARITSYN.

Zarlino, Giuseppe, joo-sēp'pē dzār-lē'nō, Italian composer: b. Chioggia, near Venice, 1520; d. Venice 14 Feb. 1590. He became a Franciscan in 1537 and in 1541 went to Venice to study music with Willaert. In 1565 he was appointed choir master of Saint Mark's, Venice, and continued in that position till his death. He was especially famous for the music he composed to be performed on the occasion of the victory of Lepanto. He determined the relations of the tones and semi-tones more precisely than had previously been done, and on this subject wrote 'Istituzioni armoniche' (1562-73). Other works of his are: 'Dimostrazioni armoniche' (1571); 'Sopplementi musicali' (1588). Among his musical compositions may be named 'Modulationes' (1566); 'Lectiones pro Mortuis' (1563).

Zarncke, tsārn'kē, Friedrich, German scholar: b. Zahnestorf, near Brüel, Mecklenburg-Schwerin, 7 July 1825; d. Leipsic 15 Oct. 1891. After study at Rostock, Leipsic, and Berlin, he founded the 'Litterarisches Zentralblatt für Deutschland' at Leipsic in 1850, and in 1858 became professor at the university there. His work in connection with mediæval literature was of particular importance, and his chief publications were his edition of Brant's 'Narrenschiff' (1854), and joint-edition of Benecke's 'Middle High German Lexicon' (1863). His valuable library was acquired by Cornell University. Among his further writings were a study of Christian Reuter (1884) and 'Kurzerfasstes Verzeichniss der Originalaufnahmen vom Goethes Bildniss' (1888).

Zarskoje-Selo, zār-skō't-sā'lō, Russia. See TSARSKO-SELO.

Zauberflöte, tsow'bēr-flē'tē, Die ('The Magic Flute'), an opera by Mozart, first produced at Vienna in September 1791, under the direction of the composer. A French version of the opera bears the title 'Les Mystères d'Isis.'

Zavala, thā-vā'lā, Joaquin, Nicaraguan politician: b. Nicaragua about 1839. He entered the army, became prominent in political affairs and was president of Nicaragua 1879-83.

He was afterward minister to the United States and in 1893 headed the insurrection which secured the deposition of President Sacaza in May 1893. On 17 July of that year he was declared provisional president, but only to lose his position through another revolt a fortnight later.

Zbylitowski, zbi-li-tow'ské, Andre, Polish writer, philosopher and poet: b. Galicia 1732; d. 1813. He was doctor of philosophy for a time at Cracow and later made extensive travels through South America and Europe. He has published 'Rhythms in Polish Verse' (1763); 'The Marshal'; 'A Beard'; etc.

Zbylitowski, Pierre, Polish writer and poet: b. in the palatine of Lublin 1684; d. Warsaw 1757. He was educated at the University of Warsaw and after leaving there traveled extensively through Europe and North America. He has published 'Porydia' (1734); 'Epigrams' (1735); 'Lucie,' a poem (1739); etc.

Zea, thá'a, Francisco Antonio, Colombian naturalist and statesman: b. Medellin, New Granada (Colombia), 21 Oct. 1772; d. Bath, England, 28 Nov. 1822. After study at the College of Popayan, he was connected with the botanical expeditions of Mutis, in 1795 was sent to Spain under arrest on the charge of circulating republican literature, and though acquitted in 1799 was forbidden to return to New Granada. He carried on botanical researches in Europe, but in 1815 joined Bolivar at Jamaica. In 1819 he was chosen vice-president of Colombia by the congress of Angostura, and in 1820 went to Europe as envoy of the Colombian republic to France and England. He has sometimes been styled the "Franklin of Colombia." Among his published works are: 'Memoria sobre la Quina según los Principios de Mutis' (1800), and a 'Historia de Colombia' (1821).

Zea, zé'a. See **Cnos**.

Zealand, zé'land, or **Stjælland**, Denmark, the largest island of the kingdom, between the Cattegat and the Baltic, separated from Sweden by the Sound and from Funen by the Great Belt; area, with the two southern islands of Møen and Samsøe, 2,793 square miles; pop. 833,702. It has no mountains; but the surface is finely variegated, having small hills and fields of a fertile soil, intersected by canals. It produces large crops of corn, and has excellent pasture. Besides several other towns of considerable importance, it contains the fortress of Elsinore or Helsingör, and the capital and royal residence, Copenhagen.

Zealand, or **Zeeland**, Netherlands, a province bounded south by Belgium, and west by the North Sea; area, 690 square miles. Capital, Middelburg, in the island of Walcheren; principal seaport town, Flushing. The province consists of a low-lying tract of land on the frontiers of Belgium and on the southern shore of the estuary of the Schelde, and of the islands of Walcheren, North and South Beveland, Schouwen, Tholen, etc., separated from each other and from the mainland by arms of the Schelde, from which and from the North Sea it is protected by dikes. As a whole the province is flat and fertile, producing excellent crops of the ordinary cereals, a considerable quantity of clover, rape, and madder, and a superabundance of excellent fruit. The grass

lands also are rich and extensive. The climate is rather moist, but comparatively healthful. Large tracts partially covered by the sea have in recent times been successfully reclaimed. Pop. about 225,000.

Zeal'ots, a sect of the Jews, composed of the more fanatical elements opposed to Roman rule. They led a revolt against the Romans in 6 A.D., and after that frequently robbed and murdered those whom they knew to be supporters of or sympathizers with the Romans. Felix tried to suppress them by crucifying all of the sect whom he could capture, but this only caused an increase in the number of their acts of violence. They continually stirred up the Jews against the Romans, and were largely influential in bringing on the Jewish war of 66-70, which resulted in the overthrow of Jerusalem.

Zeballos, thá-bál'yós, or **Ceballos**, Pedro (ZEBALLOS CORTES Y CALDERON), Spanish general: b. Cadiz 25 June 1715; d. Cordova 26 Dec. 1778. Entering the army as a cavalry captain in 1738, he became a lieutenant-general in 1755 and was despatched to Buenos Ayres as governor the next year. On the outbreak of the war with Portugal and England in 1762, Zeballos besieged the Portuguese port of Colonia de Sacramento, near the entrance of the Uruguay River, forcing its surrender 2 Nov. 1762, and capturing 26 English ships in its harbor. He returned to Spain in 1767 and in 1777 was made viceroy of the newly established viceroyalty of La Plata. On his way thither he wrested Santa Catharina from the Portuguese and retaking Colonia de Sacramento, which had reverted to Portugal since its former capture, destroyed it. He was relieved of his duties in 1778 and returned to Spain.

Zebid, zé-béd', Arabia, a town in Yemen, on the inland route from Hodeida to Mokha, 60 miles north of the latter. It was formerly the seat of a long line of princes, and was famous for its commerce and learning. The population has dwindled to 7,000 inhabitants.

Zebra, the name of several animals, natives of Africa, belonging to the family of the horses. The zebra belongs to the same general type as the ass, distinguished from *Equus* (the horse) proper by smaller size and by having the body more or less banded black upon yellowish. The forelegs only possess the "warts," seen in both fore- and hind-limbs in the horses; and the tail is "tufted." The typical or mountain zebra (*Equus zebra*) inhabits South Africa, but it is now almost extinct. A few specimens, however, are strictly preserved in the mountainous districts of eastern Cape Colony, where, until about 1875, they abounded in herds on the plains. The body is cream-colored, its characteristic bands being deep black. The stripes are drawn at right angles to the axis of the body. The legs are striped right down to the hoof, but the under part of the body has no stripes. The neck bears a faint development of skin or dew-lap, and the mane is very short. The animal was long considered untamable, but experiments made since 1872 have shown that with proper treatment it can be made to work well in harness. Any general utilization and improvement of it, however, seems impracticable. The dauw, or Burchell's zebra (*Equus burchelli*), is higher and more graceful than the true zebra.

ZEBRA PARRAKEET — ZECHARIAH

and is the one commonly seen in menageries. Its stripes are narrower and somewhat differently disposed from those of the true zebra, and extend under the belly, but are absent from the lower part of the legs. It has been driven northward, and is now rare even in the Transvaal. Chapman's zebra (*E. chapmani*) is another variety, found from Bechuanaland north to the Sudan. Grévy's zebra (*E. grevyi*) is restricted to Abyssinia and Somaliland. The quagga (q.v.) is a near ally of the zebras. Consult Lydekker, 'Royal Natural History,' Vol. II. (London 1895); Tegetmeier and Sutherland, 'Horses, Zebras, Mules and Mule-breeding' (London 1895).

Zebra Parrakeet, an Australian or East Indian parrot. See BUDGERIGAR.

Zebra-shark. See TIGER-SHARK.

Zebra Wolf, an early colonial name for the wolf-like, striped, predatory marsupial of Tasmania. See DASYURE.

Zebra Wood, in botany and commerce: (1) A kind of wood, imported from South America, and used by cabinet makers, produced by *Connarus guianensis* (*Omphalobium lam-berti*), a large tree belonging to the natural order *Connaraceae*, and growing in Guiana. Its colors consist of brown on a white ground, clouded with black, and each strongly contrasted, thus somewhat resembling the skin of a zebra. It is also called pigeon wood, and is used for furniture. (2) The wood of *Eugenia fragrans*, variety *cuneata*. It is a shrub about eight feet high, growing in Jamaica. (3) The wood of *Guetardia speciosa*, an evergreen tree 25 feet high, with scarlet-colored flowers, growing in the East Indies.

Zebu, zē-boo' or thā-boo', Philippine. See Cebu.

Zebu. See INDIAN HUMPED CATTLE.

Zebulun, zēb'ū-lūn, or Zebulon, the tenth of Jacob's 12 sons, and the sixth and last by his wife Leah (Gen. xxx. 19-20). Of his individual history nothing is related in the Scriptures, but his name was given to one of the 12 tribes of Israel, and to a region of Palestine. At the time of the exodus from Egypt the tribe of Zebulon moved in the van, following the tribes of Judah and Issachar. The territory of the tribe lay in the fertile hilly country to the north of the plain of Jezreel, and included Nazareth. The tribe of Zebulon was inferior in importance to several of the other tribes and its tribal existence closed when Tiglath-Pileser carried its principal members, with the northern tribes, into captivity (II. Kings xv. 29).

Zech, Frederick, American pianist and composer: b. Philadelphia, Pa., 10 May 1853. Taken to San Francisco when very young, he began to study music there and afterward studied in Berlin, 1877-82. Since the year last named he has resided in San Francisco, where he has been conductor of the symphony orchestra and has given many piano recitals. Among his many compositions are four symphonies, four concertos for piano and orchestra, two symphonic poems, 'The Eve of Saint Agnes,' and 'The Raven'; an opera, 'The Cruise of the Excelsior'; sonatas and songs.

Zechariah, zēk-ā-rī'ā, the eleventh in order of the Hebrew writers known as minor proph-

ets. Little is known of his personal history, but he first publicly discharged his office as priest in the second year of Darius 519 a.c. He is called in his prophecy the son of Berechiah and the grandson of Iddo, but in the Book of Ezra he is termed 'the son of Iddo.' He was priest as well as prophet and is associated with the prophet Haggai. Tradition states that Zechariah had much to do in furnishing the liturgical services of the temple, and in the Septuagint and Vulgate versions several psalms are attributed to him. He deals in his prophecy with the same objects as occupied the mind of the prophet Haggai. His style is characterized by symbolic vision and dramatic action. It is distinctly Apocalyptic. This form of prophecy never predominated until after the Exile and seems to have constituted an element in the last and most powerful appeal made by the mouthpieces of Jehovah to the heart and conscience of His people.

Contents of the Prophecy.—The greater portion of the Book consists of a series of visions intended to represent grounds for national confidence and to encourage national effort. The prophecy opens with an exhortation to repentance and a warning against neglect of the prophet's word. The remainder of the book consists of two sections. The first section runs from Chapters i. to vi.

Ch. i. 15 contains nine symbols, mostly visions, accompanied by their interpretations:

Ch. i. 8-17, a vision of the horses of Jehovah, which, as His messengers, report to Him; along with His reply.

Ch. i. 18-21, four horns, representing the opponents of Israel, are broken.

Ch. ii., a man with a measuring-line lays out the restored Jerusalem.

Ch. iii., Joshua, the high priest, is accused by Satan, and acquitted, and is honored with commissions and revelations from Jehovah.

Ch. iv., the beautiful symbol of the golden candlestick and two olive trees, with the practical application of encouragement to Zerubabel.

Ch. v. 1-4, a flying roll recording a curse upon immoral actions.

Ch. v. 5-11, an ephah measure containing a woman is seen carried away to Babylon.

Ch. vi. 1-8, four chariots, each having horses of a particular color, are the four heavenly spirits charged to carry out God's purposes in the earth.

Ch. vi. 9-15, the symbolical action of crowns of silver and gold being made and placed upon the head of Joshua the high-priest, who thus represents the Messiah-priest upon His throne.

The second section runs from chapters vii. to xiv. In ch. vii. the prophet, in answer to a question as to observance of a certain fast, replies that the true fast is justice, mercy and piety, which had been so much neglected in earlier generations. This suggests, in ch. viii., the coming Messianic time, when the city shall be populous and happy under the renewed protection of Jehovah, and the fasts shall be joyful feasts, attended by multitude of strangers seeking His favor.

There is so much that is matter of dispute in ch. ix.-xiv., as regards their date and immediate application, that we shall have to content ourselves with a summary and a few general re-

ZEDEKIAH — ZEEMAN EFFECT

marks. The contents are largely symbolical and figurative. Ch. ix.-xi. form a division by themselves, perhaps written by the Zechariah of Isa. viii. 2. It has an entirely different historical setting from that of ch. i., 8. Here we are transported back to the 8th century a.c. Ch. ix. 1-8 refers to conquests made by Tiglath-pileser III. (745-727 a.c.). Northern Israel is still in existence, and Assyria is still in its "pride" (x. 10ff.). These allusions form part of the very texture of the prophecy, and are assumed by some to be old fragments embedded in a post-Exilic work.

Ch. ix. 1-8, Syria, Phœnicia, and Philistia are to be brought low. Yet a remnant of the Philistines shall be united with Judah, and both shall be under the protection of Jehovah. Ch. ix. 9-17, the Messiah shall come as the Prince of Peace to restore the dispersed of Israel, and save them from their enemies. Ch. x., the people are entreated to turn to Jehovah in their troubles, and not to diviners and images. Jehovah will be the defender alike of Judah and Israel, restoring and strengthening them, and bringing low their oppressors. Ch. xi. announces the shock of war which appals the rulers of Judah (ver. 1-3). The rest of the chapter is allegorical. It represents Jehovah as rejected by His people, they being in turn rejected by Him, their true Shepherd. By an expressive figure, the brotherhood of Judah and Israel is declared to be broken. Ch. xii. 1 to xiii. 6, the nations come against Jerusalem; but Jehovah defends and saves it. The conflict is shown to be spiritual, for a spirit of grace and supplication is to be poured upon Judah and Jerusalem. Also a fountain is to be opened for the cleansing of guilt, and the idols and false prophets are to be banished. Ch. xiv.—Again Jerusalem is besieged, and this time it is taken, half the people going into exile; but the residue are saved. After various figurative illustrations of the processes and results of the Messianic reign, it is declared that the survivors among the nations shall go up to worship in Jerusalem, which shall be wholly consecrated to Jehovah.

Zedekiah, zēd-ē-k'fā, the last king of Judah of the line of David. He was the third son of Josiah and Hamutal and his name was originally Mattaniah. At 21 he was appointed by Nebuchadnezzar to succeed his nephew Jehoiachin (whom he had carried to Babylon) as king of Judah (about 599 a.c.), and changed his name to Zedekiah. He took an oath of allegiance to Nebuchadnezzar, which he afterward broke, and entered into a league with Egypt against him. His action in so doing was denounced by the prophet, Jeremiah, who, as well as Ezekiel, then in Chaldea, predicted the approaching fall of Jerusalem. Jerusalem was besieged by Nebuchadnezzar and taken in 588 a.c., after a siege of a year and a half, the temple and city destroyed, and the leaders of the Jews carried captive. Zedekiah, whose sons were killed in his presence, had his eyes put out, and was carried in fetters of brass to Babylon, where he died, but the time of his death is unknown. His history is recorded in the books of Kings and Chronicles, and more fully in Jeremiah.

Zedlitz, tsēd'ltz, Josef Christian von, Austrian poet: b. Johannisberg, Austrian Silesia, 26

Feb. 1790; d. Vienna 16 March 1862. He served in the Austrian army at the battles of Regensburg, Aspern, and Wagram, and afterward entered the service of the Austrian foreign-office. His dramas 'Kerker und Krone' (1834); 'Der Stern von Sevilla' (1830), etc., were long popular, but he is best known by his pleasing lyrics and ballads, 'Totenkränze,' a collection of elegies (1827); 'Soldatenbüchlein' (1848).

Zedlitz, von, Karl Abraham, BARON, Prussian statesman: b. Landshut, Silesia, 1731; d. 1793. He was appointed minister of justice in 1770, and was placed at the head of the department of ecclesiastic affairs and public instruction in the next year. He did much to uphold the liberty of the press and was a leader in the matter of prison reform. He resigned office in 1789.

Zedoary, certain species of *Curcuma*, natives of India, China, etc, whose rootstocks are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger, although less effective. The round zedoary is the produce of *C. aromatica Zedoaria*, having palmate rootstocks, straw-colored within, which are used like turmeric for dyeing. Long zedoary is produced by *C. aerumbet*, having long palmate rootstocks, yellow within. Zedoary is a powerful sudorific, and is employed in the Orient in alterative medicines and for incense.

Zeehan, zē'hān, Tasmania, a mining township on the west coast near the base of Mount Zeehan, from which it takes its name, and 29 miles from the port of Strahan on Macquarie harbor. The township owes its existence to the discovery in 1884 of rich silver-lead ore in great abundance, extending over an area of more than 160 square miles. Pop. 10,000.

Zeeland, zē'lānt, Netherlands. See ZEE-LAND.

Zeeman, Remigius, Dutch marine painter: b. Amsterdam about 1609; d. there about 1672. His real name was Nooms, but he received the name of Zeeman from painting marine subjects. There are a number of his works in the royal palaces at Berlin, where he resided for a number of years. He also produced several etchings of more than ordinary merit.

Zeeman Effect, a phenomenon highly important in connection with theoretical physics, discovered in 1897 by Dr. Pieter Zeeman, of the University of Amsterdam. It consists in the doubling (or further multiplication) of the lines of the spectrum of a substance, when the source of the light under examination is placed in a powerful magnetic field. (See SPECTROSCOPY.) The results that are obtained under varying conditions are too complicated to admit of full discussion in the present place. In general, however, it may be said that when the ray of light under examination travels in a direction parallel to the lines of force in the magnetic field, each line of its spectrum is separated into two lines, which are collectively known as a "magnetic doublet." The two components of such a magnetic doublet have (in general) the same intensity, and they are circularly polarized in opposite directions. Previous to Dr. Zeeman's discovery, no source of light was known, the rays from which were completely polarized, either circularly or otherwise. In order to ob-

serve the Zeeman effect properly, it is essential for the magnetic field to be both intense and uniform, and for the spectroscopy to have a high resolving power. An idea of the order of magnitude of the phenomenon may be had from the following fact: In a magnetic field whose intensity is 10,000 C. G. S. units, each of the two well-known D lines of sodium is resolved into a doublet, and the separation of the constituents of either of these doublets is approximately equal to one twelfth of the distance between the original D lines.

When the ray of light under examination leaves the magnetic field in which it originates in a direction perpendicular to the lines of magnetic force, the phenomena that are observed are much more complicated. The lines of the spectrum are often observed to be triple, and not infrequently they are quadrupled, or even more complex. In all cases, however, each constituent of the modified line is completely polarized; but the polarization, instead of being circular as before, is now plane. The several constituents into which each primitive line is resolved may, in fact, be divided into two groups, one of which is polarized in a plane parallel to the lines of magnetic force, while the other is polarized in a plane perpendicular to those lines.

It will be observed that the Zeeman effect is due, apparently, to the influence of the magnetic field upon the ultimate molecular mechanism which is concerned in the very genesis of the light-ray; and herein lies its great theoretical importance. The ordinary theories of light treat of the propagation of luminous waves through the ether and through matter, after those waves have left their source; and little is known of the way in which a light-wave originates, at the atom which presumably gives it birth. The phenomenon discovered by Dr. Zeeman enables us to trace the consequences of modifying, by direct experimental means, the ultimate conditions that prevail at the very source of the light; and for this reason it is likely to lead to results of the highest importance with respect to the structure of matter and the nature of the ether and its motions. At the present day, physicists are of the opinion that the atoms which constitute matter are themselves composed of far smaller particles called "electrons" (q.v.), the electron, or ultimate unit in the structure of matter, being of the nature of a tiny disembodied charge of electricity. Light is believed to be due to the motions of these electrons within the atoms; and the Zeeman effect is believed to be due to the influence of the magnetic field upon the motions of the electrons. See LIGHT; ETHER; ELECTRON; SPECTROSCOPY. Consult, also, Cotton, 'Le Phénomène de Zeeman'; Lewis, 'Effects of a Magnetic Field on Radiation,' in the 'Scientific Memoir Series.' As the subject is now undergoing extensive investigation, reference should also be made to current scientific periodicals.

A. D. RUTHER, Ph.D.,

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Zegedin, Stephen de, Hungarian Protestant theologian: b. Zegedin 1505; d. Revim, Hungary, 2 May 1572. He studied under Luther and Melancthon at Wittenberg, and taught and preached abroad throughout the cities of Hungary; was taken prisoner by the Turks, who treated him with great cruelty. Among his

works were: 'Speculum Roman Pontificum Historicum' (1600); 'Assertio de Trinitate' (1573); 'Tabulae Analyticae in Prophetas, Psalmos, et Novum Testamentum' (1592).

Zegedin, Hungary, city in Csongrad, near confluence of the rivers Maros and Theisse. It is one of the largest towns in Hungary and has manufactures of woollens, leather, and toys. Being located adjacent to two navigable rivers, it controls the commerce of a large surrounding district. Pop. 35,000.

Zegers, ză'gers, Hercules, Dutch landscape painter: b. about 1625. He was an artist and engraver of great merit, but notwithstanding the general excellence of his works he found great difficulty in disposing of them, and, becoming discouraged, fell into habits of intemperance. After his death his works sold for very high prices.

Zegers, Tacite Nicolas, Flemish theologian: b. Brussels in the latter part of the 15th century; d. there 1559. According to all authorities he was one of the greatest critics of his time. Among other works he published an edition of the New Testament in Latin (1559).

Zella, ză'la, Zaylah, or Sela, Northeast Africa, a seaport of the British Somali Coast Protectorate, on the Gulf of Aden, a few miles southeast of Jibuti, the port of French Somaliland. Its former commercial importance as the terminus of caravan routes from Harar and Shoa in Abyssinia, has diminished since the construction of a railroad from Jibuti to Harar. Pop. 12,000.

Zeller, ză'ler, Martin, German geographer: b. Styria 1589; d. 6 Oct. 1661. He was one of the foremost authorities of his time, and a voluminous writer on various subjects. He published some useful works on the geography and topography of Germany.

Zeisberger, tsă'berg-er, David, American Moravian missionary among the Indians: b. Zanchenthal, Moravia, 11 April 1721; d. Goshen, Tuscarawas County, Ohio, 17 Nov. 1808. Educated in Saxony, he emigrated to Georgia in 1740, then went to Pennsylvania, and was one of the founders of the town of Bethlehem. In 1743 he became a missionary to the Indians, and labored until the breaking out of the Indian war in 1755 among the Delawares at Shamokin (Sunbury, Pa.), and the Iroquois at Onondaga. In the time of the Pontiac conspiracy, he assisted in ministering to the Christian Indians for whom the governor of Pennsylvania had provided a refuge at the barracks at Philadelphia. Peace having been concluded, he led the remnant of these Indians to Wyalusing, on the Susquehanna, in Bradford County, Pa. In 1767 he penetrated through the wilderness to Goshunk, on the Allegheny, in Venango County, and established a church among the Monseys. He removed with his flock in 1770 to the Beaver Creek, and began another station, called Friedentadt, in what is now Lawrence County; two years later explored the Muskingum region, in the present State of Ohio, and laid out an Indian town, Schoenbrunn, on the Tuscarawas. After a time he was joined by all the Moravian Indians of Pennsylvania, whom the march of civilization drove westward. Two more towns were built, a number of other missionaries entered the field, and many new converts were

added. In 1761 the Wyandots fell upon the settlement of the Christian Indians at Gnadenbutten and massacred many of them. This was a death blow to the Moravian mission among the Indians. With a small remnant Zeisberger built an Indian town, in what is now the State of Michigan, but in 1786, at the head of a small band of followers, he returned to Ohio, and in the following year commenced a new settlement, which he called New Salem, in Huron County. In 1791 the hostility of other Indians obliged them to emigrate to Canada, where they founded Fairfield, on the river Thames. In 1798 the United States Congress having granted to the Moravian Indians the tract of land in Ohio upon which they had formerly been settled, Zeisberger returned to that country with some of his converts, and near the ruins of their once flourishing towns established a new station, to which he gave the name of Goshen. There he preached until the close of his life. His published works are: a 'Delaware and English Spelling Book' (1776); 'A Collection of Hymns in Delaware' (1803); 'Sermons to Children,' in Delaware (1803). In recent years have appeared his 'Dictionary in German and Delaware' (1887); 'Diary of David Zeisberger 1781-98' (1888); and 'Essay toward an Onondaga Grammar' (1888). Consult Schweinitz, 'Life and Times of David Zeisberger' (1870).

Zeise, tsí'sé, Heinrich, German poet: b. Altona (province of Schleswig-Holstein, Prussia) 19 April 1822. He was an apothecary successively in Altona and Copenhagen, and from 1863 to his retirement in 1875 was proprietor of a chemical manufactory at Altona. He finally settled in Grossflotbek, near Altona. During an extended journey through Norway, Sweden, and Denmark, he familiarized himself with Scandinavian literature, and subsequently he translated the writings of Oehlenschläger, Andersen, Holst, Jørgen, Moe and others, and works of natural history by Schouw and Oersted. Zeise's original verse is often careless in diction, but has generally a pleasing quality, and reaches a stirring note in his patriotic songs, many of which are among the more valuable in his collection of 'Deutsche Kriegs- und Siegeslieder' (1864). Among his volumes are: 'Reiseblätter aus dem Norden' (1848); 'Gedichte' (2d ed. 1852); 'Neuere Gedichte' (1850); 'Kampf- und Schwertlieder' (1849); 'Kleine Lieder' (1871); 'Aus dem Leben und den Erinnerungen eines Nord-Deutschen Poeten' (1888); and 'Natur- und Lebensbilder' (1892).

Zeising, tsí'sing, Adolf, German writer on aesthetics: b. Ballenstedt (Anhalt) 24 Sept. 1810; d. Munich 27 April 1876. He wrote 'Neue Lehre von den Proportionen des menschlichen Körpers' (1854); 'Ästhetische Forschungen' (1855); 'Religion und Wissenschaft' (1873); and several works of fiction. For a time he held a professorship in the Bernburg (Anhalt) gymnasium, but after 1853 devoted himself to letters, residing generally in Munich.

Zeitun, zî-toon', or **Zeitun**, Asiatic Turkey, a town in the province of Aleppo, 25 miles northwest of Marash, in an iron-mining district, inhabited chiefly by Armenian Christians. The district is fertile but mountainous. The people,

distinguished by their martial spirit and their immunity from crimes of violence, are descendants of the Armenian kingdom which existed in Cilicia from the 11th to the 14th century. A sanguinary conflict with Turkish troops soon after the Crimean war drew European attention to the community, and it was stopped by the intervention of the British and French consuls. In 1878, 1890, and 1895 they defended themselves successfully from Turkish oppression, securing favorable conditions of peace. Pop. 20,000.

Zeitz, tsits, Germany, a town in the province of Saxony, Prussia, on the Weisse Elster, 23 miles by rail southwest of Leipsic. A gymnasium, and a library in a former Franciscan monastery are among its educational institutions. It is a busy industrial centre with manufactures of woollens, cottons, calicoes, leather, hosiery, mineral oil, sugar, pianofortes, cycles, etc.

Zela, zé'la, an ancient town of Asia Minor, in the Pontus, where Julius Cæsar defeated Pharnaces, king of Pontus and son of Mithridates, and announced his victory to the Roman Senate, in the famous brief despatch, *Veni, vidi, vici*—'I came, I saw, I conquered.' This battle ended the war; Pharnaces escaped into Bosphorus, where he was slain by his lieutenant, Asander; Pontus was made a Roman province, and Bosphorus was given to Mithridates of Pergamus, 47 B.C.

Zelaya, thá-lá'yá, José Santos, Nicaraguan statesman: b. Managua, Nicaragua, about 1845. Educated in England, he entered the Nicaraguan army and was made a general in 1885. He became the leader of the Liberal party and united with Joaquín Zavala in the revolt of April-June 1893, which resulted in the overthrow of President Sacasa. When Zavala was made provisional president Zelaya rebelled and Zavala was obliged to resign. A new constitution was then proclaimed, under which Zelaya was elected president 17 Sept. 1893. In the next year he invaded the Mosquito territory and in May 1895 an English force held the port of Corinto for a short time until Nicaragua agreed to pay indemnity for the murder of an English subject.

Zelaya, Mexico, a town of Guanajuato, on the Rio Grande de Santiago, 120 miles northwest of Mexico City. It is a cotton manufacturing centre. The chief buildings are a large and elegant cathedral and several convents. Pop. 10,000.

Zelko'na Tree, a large elm-like tree (*Planera richardi*), native to the Orient. The timber is much prized, the heartwood when dry being exceedingly hard, capable of a fine polish, and an excellent furniture wood.

Zell, tsél, Karl, German philologist and archaeologist: b. Mannheim, Baden, 8 April 1793; d. Freiburg-un-Breisgau, Baden, 21 Jan. 1873. He studied in Heidelberg, Göttingen, and Breslau, was made professor of philology at Freiburg in 1821, and, as representative of the university in the first Baden chamber in 1831-5, secured a reorganization of the system of higher education in the grand duchy. He was made a member of the council for higher studies, with the title of ministerial councillor. From 1846

until his retirement in 1855, he was professor of archæology at Heidelberg, where his lectures were very inclusive in their scope. His scholarship is amply shown by his studies of Aristotle and the Aristotelian philosophy. He was prominent in the Catholic Church, and president of the assemblies of the Catholic Union in 1852 and 1853. Among his writings are: 'Observationes Criticæ de Aristotele' (1817); 'Ethica Nicomachea' (1820); a translation (1834) of the 'Organon'; 'Bilder aus der Gegenwart' (1855); and some *opuscula academica*.

Zeller, tsél'lér, Edward, German theologian and historian of Greek philosophy; b. Kleinbottwar, Württemberg, 22 Jan. 1814. He studied at Tübingen and Berlin, and was made *privat-docent* at Tübingen in 1840. Though bitterly opposed by the more orthodox, he became professor of theology at Bern in 1847, and at Marburg in 1849. Appointed to the chair of philosophy at Heidelberg in 1862, he went to Berlin in 1872 and retired in 1895. He early forsook theology and his Hegelianism for historical work which reveals the most impartial and eclectic spirit. Among his writings the following are the most important: 'Platonische Studien' (1839); 'Die Philosophie der Griechen,' his greatest work (1844-52; 4th ed. 1876-81); 'Das Theologische System Zwingli's' (1853); 'Die Apostelgeschichte kritisch untersucht' (1854; English trans. 1875-76); 'Vorträge und Abhandlungen' (1865; 2d ed. 1875-77-84); 'Staat und Kirche' (1873); 'David Friedrich Strauss' (1874); 'Geschichte der deutschen Philosophie seit Leibnitz' (1872); 'Friedrich der Grosse als Philosoph' (1886). His work on Greek philosophy has been translated into English under the titles 'Socrates and the Socratic Schools' (1868); 'Stoics, Epicureans, and Sceptics' (1870); 'Plato and the Older Academy' (1876); 'The Pre-Socratic Philosophy' (1881); 'The Eclectics' (1883); 'Aristotle' (1897).

Zeller, zél-lâr, Jules Sylvain, French historian; b. Paris 23 April 1820; d. there 25 July 1900. After study in Paris and afterward in Germany, he held the chair of history successively in the lycées of Rennes, Bordeaux, and Strasburg, in the faculty of Aix, and in the Paris normal school. In 1863 he was made professor of history in the Ecole Polytechnique, in 1874 member of the Academy of Moral and Political Sciences, and in 1876 inspector-general of higher education. His works include: 'Les Empereurs Romains' (1863); 'Entretiens sur l'Histoire' (1865); 'Pie IX. et Victor Emmanuel' (1879); 'Histoire de l'Allemagne' (1872-91); and 'Histoire Resumée de l'Allemagne' (1888).

Zemstvo, or *zemskiy uchrezhdeniya* (district institutions), a Russian political body, originally designating the country people, but now used for the province and its representative body, comparing favorably with our State legislatures. The Zemstvo was first mentioned by Alexander II. in the imperial edict of 1859, and after years of labor in perfecting it, in January 1864, was officially recognized by him as an institution. Its original intent was the greatest possible development of local home rule, the members of the district assemblies or zemstvos being elected by three different electoral classes—the land owners, the city people and the country inhabi-

tants—thereby introducing for trial a sort of constitutional representation. Before long, however, dissensions arose, the central government accusing the zemstvos of assuming too much authority, of becoming too liberal, and by several edicts the orderly development of these districts was checked. Finally by the edict of June 1890 the zemstvo representation was limited to two classes of citizens—the hereditary and personal nobility and the burghers of the cities—thus depriving the peasants entirely of their elective franchise, their representatives now being selected by the governors and by members of the volost assemblies.

Zenana Mission, a mission founded in 1852 under the auspices of the Protestant missionary societies in India, with the object (1) of sending the Gospel to the women of India by means of female missionaries; (2) of alleviating their sufferings in sickness, and ministering to their spiritual need; and (3) of promoting education, based on Holy Scripture, especially among women of the higher classes. See INDIA.

Zend, more correctly **Avestan**, an ancient Iranian language, in which the Zend-Avesta is composed. This language was first introduced to notice by Anquetil Duperron, and the accurate knowledge of it has been developed among others by Rask, Burnouf, Bopp, and Haug. It is now recognized to be a cœveal and cognate dialect with the Vedic Sanskrit. It embraces two dialects called Bactrian, in contradistinction to the ancient languages of Media and Persia, which are called the Western Iranian, while the Zend or Bactrian dialects are called the Eastern Iranian dialects. The two Zend dialects consist of an earlier and a later, analogous to the Vedic and classic Sanskrit or to the Homeric and classic Greek. The period of transition between them is perhaps from 100 to 200 years. The earlier dialect is called the Gâthâ, from the Gâthas or sacred songs which form the only remains of it; the later is that in which the greater part of the Zend-Avesta or Zoroastrian sacred writings are found. They differ both in grammar and pronunciation, they are both highly cultivated languages, and rich in inflections, but the earlier is richer in inflections and the later in compounds. The earlier is distinguished by long vowel terminations, probably produced by transcribing the singing pronunciation of the gâthas. The present alphabet is comparatively modern, and is probably derived from the Syriac. There are 12 simple vowels, 14 diphthongs, and 29 consonants, represented by separate characters. The roots are mostly monosyllabic, some consisting only of a single vowel, others of a vowel and consonant or a vowel between two consonants. These primitive roots are modified by articulate additions, which extend or limit their meaning after the manner of prefixes and suffixes, thus *dâ*, to make, with the addition of *th*, becomes *dath*, to place. Verbal roots undergo modifications producing three distinct forms, the causal, the desiderative, and the intensive. Verbs have three voices, active, middle (reflective), and passive; and four moods, indicative, subjunctive, potential, and imperative. Some of these moods are double. The tenses include one for the present, four for the past, and two for the future. Nouns are

formed from roots by means of suffixes. There are three genders, masculine, feminine, and neuter. There are also three numbers, singular, dual, and plural, with eight inflections in the first and last and five in the middle number. The forms of the declensions closely resemble those of Sanskrit; and there are many other analogies between the Gāthā dialect and the Vedic Sanskrit. See SANSKRIT LANGUAGE AND LITERATURE.

Zēnith, the vertical point of the heavens at any place, that is, the point right above a spectator's head, and from which a line drawn perpendicular to the plane of the horizon would, if produced, pass through the earth's centre, supposing the earth a perfect sphere. Each point on the surface of the earth has therefore its corresponding zenith. The zenith distance of a heavenly body is the arc intercepted between the body and the zenith, being the same as the co-altitude of the body.

Zenith Sector, an astronomical instrument, consisting of a telescope swinging upon pivots, and having attached to it an arc graduated into degrees and minutes. It is used for the same purpose as the mural circle, namely, to ascertain the zenith distance of the several stars.

Zenith Telescope, an instrument used in field astronomy for the determination of latitudes, by the measurement of the difference of meridian-zenith distance of two stars, one culminating north of the zenith, and the other at so nearly the same distance south that that difference can be measured by a filar micrometer in the field of the telescope when the latter is revolved 180° round a vertical axis between the two culminations.

Zenjan, zēn-jūn', or Zinjan, Persia, a town in the province of Khamseh, 170 miles northwest of Teheran, on the highway to Tabriz. It has manufactures of carpets, woolen cloths, and arms. Pop. 20,000.

Zenkoji, zēn-kō'jē, Japan. See NAGANO.

Zeno, zē'nō, Emperor of the East (Byzantine empire) from 474 to 491 A.D. An Isaurian by birth, he married the daughter of Leo I, commanded the imperial guards and armies, and was elevated to the consulship in 469; procured the assassination of Aspar, the minister of Leo, in 471, and usurped the crown on the death of Leo in 474. He was driven out of his capital by Basiliscus, who was proclaimed emperor in 475, but regained Constantinople in 477 by buying over Harmatius, the nephew and general of Basiliscus, who was deposed and died shortly afterward. In 478 a Gothic invasion was bought off; in 479 a revolt in Constantinople was put down by corrupting the troops engaged; a second Gothic invasion was bought off, and a third was repelled by purchasing the aid of an opposing party among the Goths, one of whose chieftains, afterward Theodoric the Great, was made consul in 484. Having quarreled with Theodoric, Zeno, anxious to save himself and his capital, proposed to him to invade Italy, and expel Odoacer and the Heruli. Among the more important events of his reign was the publication of the so-called 'Henoticon' (482), or 'Decree of Union,' intended to adjust the controversy between the Monophysites (q.v.) and the Orthodox Church.

Zeno, dzā'nō, Apostolo, Italian dramatist and literary historian: b. Venice 11 Dec. 1668; d. there 11 Nov. 1750. He was a founder (1710) of the critical periodical 'Giornale de' Letterati d'Italia,' in 1718-29 was at Vienna as court-poet, and made his reputation in Italian literature by libretti for the musical drama, which in his work attained real literary rank. For many years he was the chief dramatic poet of Italy. He was also a scholar, antiquary, and well-known numismatist. His collected dramas appeared in 1744. Among his further writings is the 'Dissertazioni Storico-Critiche e Letterarie' (1752-3). Consult the 'Life' by Negri (1816).

Zeno, Nicolò and Antonio, Venetian navigators of the late 14th and early 15th centuries. Antonio about 1390 fitted a ship with which he sailed northward on the Atlantic. He was wrecked on one of the Faroe islands. Here he would have been killed by the Scandinavian natives had he not been opportunely rescued by Earl Sinclair, whom Hacon VI. of Norway had invested with the Orkneys and Caithness. He was made commander of the earl's small fleet, and in 1393 or 1394 sailed with three ships to Greenland, where he spent some time. He died in the Faroes about 1395. Antonio went out to the Faroes in 1391, and was in Sinclair's service for 14 years, dying at Venice in 1406. After Nicolò's death he was commander of the fleet; and on one occasion, to verify fishermen's reports of land some 1,000 miles westward, he undertook a voyage of discovery in the Atlantic. He described his adventures in a letter, and on this letter and some others and a sailing-chart, probably made by Antonio, is based a work containing matter of some interest in connection with pre-Columbian discovery in the New World. The letters were worked into a narrative, and, with a copy of the map, appeared in book-form in 1558. The narrative says that a fisherman, returning to the Faroes after a 26 years' absence, told of a land called Estotiland, where there was much gold and forest. The people built small boats and traded with Greenland. The description of Estotiland is vague, and contains little to suggest North America. But a voyage was undertaken from Estotiland to a region southward, called Drogio. There, said the fishermen, the people were cannibals. "They have no kind of metal. They live by hunting, and carry lances of wood, sharpened at the point." Farther south, "they have cities and temples," as well as "some knowledge and use of gold and silver." The honesty of the Zeno narrative has been sufficiently well established; but whether or no the fisherman had the experiences he narrated in Drogio, and whether that may be identified with North America, are questions that have been much debated. Consult: Major, 'The Voyages of Nicolò and Antonio Zeno' (Hakluyt Society, 1873), with a translation of the narrative and a copy of the map; and Fiske, 'The Discovery of America,' Vol. I. (1892).

Zeno (zē'nō) (Gk. Ζήνων), of Citiium, ancient Greek philosopher: b. Citiium, island of Cyprus. He flourished in the late 4th and early 3d century a.c., and was the founder of the Stoic school of philosophy (see STOA). The circumstances of his life are not well known. Tradition says that after suffering shipwreck near

ZENO OF ELEA—ZENONIA

the Peisima, and according to one account losing his all, while by another his wealth amounted to 1,000 talents, he settled at Athens. There he early made himself remarked for the virtues of moderation and contentment, and during his long life he so acquired the esteem of the citizens that they voted him a crown of gold and a public burial in the Ceramicus. He is said to have declined the citizenship of Athens from fidelity to his native country. He first resorted to the teaching of the Cynic Crater, and by this school his own views, especially in the earlier period of his career, were much influenced. It may seem surprising that Zeno, who rejected both the contempt for established usages and for general knowledge which distinguished the Cynics, should have attached himself to that school, but the central point of every true system of philosophy is its ethics, and he was attracted to the Cynics by their doctrines of moral obligation, which he made the foundation of his own system. Contrary to the advice of Crater he afterward studied under Stilpo the Megarian. Among his subsequent advisers or teachers are enumerated the Megarians Cronus and Philon, and the Academics Xenocrates and Polemon. Of the last two he is said to have been a pupil. He maintained a friendship with Antigonos Gonatas, king of Macedon, of whom his disciples Perseus and Philomides were companions. About 310 a.c. he opened his school in the *Stoa Poikile* (Stoa), or 'Painted Porch.' This place, which was adorned with paintings by Polygnotus, had formerly been the resort of a school of poets, who were from this circumstance called Stoics, and the name was now transferred from them to the disciples of Zeno, who at first had been called Zenonians. All the works of Zeno are lost. They were numerous, and include treatises 'On the State' (early and of cynical tendencies); 'On the Ethics of Crater'; 'On Life According to Nature'; 'On Impulse'; 'On the Nature of Man'; 'On the Affections'; 'On the Becoming' (or Fitting); 'On Law', and 'On Grecian Education'; various treatises on physics, logic, and poetry, and a work on the Pythagorean doctrine. Concerning the doctrines of Zeno, which employed very largely the ethics of the Cynic school, as well as the physics of Heraclitus and Pythagoras, consult the article STOICS referred to above; also Zeller, 'Stoics, Epicureans, and Skeptics' (1870); Ueberweg, 'History of Philosophy' (Eng. trans. 1887); and Ritter and Preller, 'Historia Philosophiæ Græcæ' (8th ed. 1898).

Zeno (Ζῆνων) of Elea, ancient Greek philosopher: b. Elea (Velia), Lucania, southern Italy, about 488 a.c. He was the favorite disciple of Parmenides, whose opinions he defended, and whose ethico-political schemes he shared. He appears to have lived for a considerable time in Athens, where he taught for remuneration, and had distinguished pupils, as Pericles and Callias. He is said, on unsatisfactory evidence, to have engaged in an enterprise on behalf of his native land against the tyrant Nearchus. Whether he perished in this attempt or survived is not known. None of his writings are extant, but his opinions are referred to by Aristotle, who attempted to confute some of them, and who has distinguished

him as the inventor of dialectic. As a defender of the Eleatic doctrine of the unity of the existent, he was the first to lay down the problems of skepticism in regard to the real existence of the phenomenal world, and has thus exercised an important influence on philosophy. He is said to have directed four arguments against the reality of motion, first from the impossibility of a moving body arriving at a place without passing through an infinite number of intermediate places; second, from the contradictoriness of relative notions of speed, based on the same reason; third, from the fact that each body at each particular moment must occupy one particular portion of space, and is therefore at rest; fourth, from the contradictoriness of relative notions of time in respect to motion, the same portion of time being regarded as long or short, according as it is measured by different standards. He is also credited with an argument against the veracity of sensuous impressions, which rests merely on an imperfect knowledge of physics. It is in this form. If a measure of millet-grains in falling produces a sound, each single grain, and each fraction of a grain, however minute, must also produce a sound; for as the results of the motion of the whole mass is but the sum of the results of the motion of its parts, if no sound is produced by the smallest of the parts, no sound can be produced by the whole. Aristotle, in his 'Physics' (VI.), pointed out the fallacies in the arguments against the reality of motion. Consult: Zeller, 'Pre-Socratic Philosophy,' Vol. I. (1881); Ueberweg, 'History of Philosophy,' Eng. trans. Vol. I. (1887); Ritter and Preller, 'Historia Philosophiæ Græcæ' (8th ed. 1898); and Zeller, 'Philosophie der Griechen,' Vol. I. (4th ed. 1900).

Zenobia, sê-nô-bî-â, queen of Palmyra (q.v.). She was instructed in the sciences by the celebrated Longinus, and made such progress that besides her native tongue she spoke the Latin, Greek, Coptic, and Syrian languages. She also patronized learned men, and herself formed an epitome of Egyptian history. She was married to Odenathus, king of Palmyra, accompanied him both in the war and the chase, and the success of his military expedition against the Persians is, in a great degree, attributed to her prudence and courage. Gallienus, in return for services which tended to preserve the East to the Romans after the capture of Valerian by Sapor, king of Persia, acknowledged Odenathus as emperor, and on his death, 267 a.d., she assumed the sovereignty, under the title of Queen of the East. She preserved the provinces which had been ruled by Odenathus, and was preparing to make other conquests, when the succession of Aurelian to the purple led to a remarkable change of fortune. That martial prince, disgusted at the usurpation of the richest provinces of the East by a female, determined to make war upon her, and having gained two battles, Antioch and Emesa, besieged her in Palmyra, where she defended herself with great bravery. At length, finding that the city would be obliged to surrender, she quitted it privately; but the emperor, having notice of her escape, caused her to be pursued with such diligence that she was overtaken just as she got into a boat to cross the Euphrates, in 272. Aurelian spared her life, but made her serve to grace his

ZENOBIA—ZEPHYRUS

triumph. The Roman soldiers demanded her life; and according to Zosimus she purchased her safety by sacrificing her ministers, among whom was the distinguished Longinus. She was allowed to pass the remainder of her life as a Roman matron; and her daughters were married by Aurelian into families of distinction. Her only surviving son retired into Armenia, where the emperor bestowed on him a small principality. Consult: Gibbon, 'Decline and Fall' (ed. Bury, 1896-1900); 'Life of Aurelian' by Vopiscus in 'Augustæ Historiæ Scriptores' (Eng. trans. Bernard, 1740); Ware, 'Zenobia, or The Fall of Palmyra' (1836).

Zenobia, or *The Fall of Palmyra*, a noted historical novel, first issued in 1836 in the 'Knickerbocker Magazine,' and then entitled 'Letters from Palmyra.'

Zenos, zē'nōs, **Andrew Constantinides**, American educator: b. of Greek parentage, Constantinople, Turkey, 13 Aug. 1855. He was graduated at Robert College, Constantinople, in 1872, studied theology at Princeton Seminary and was pastor of a Presbyterian church in Brandt, Pa., 1881-3. From 1883 to 1888 he was professor of Greek in Lake Forest University and of New Testament exegesis at Hartford Theological Seminary 1888-91. In 1891 he was made professor of church history in McCormick Theological Seminary in Chicago, and in 1894 was transferred to the chair of Biblical theology in that institution, a position he still (1904) holds. He wrote: 'Elements of Higher Criticism'; 'Compendium of Church History' (1896), etc.; and edited Xenophon's 'Anabasis' (with F. W. Kelsey) (1888).

Zenta, zēn'tō, Hungary, a town in the county of Bács-Bodrog, on the Theiss, 120 miles southeast of Budapest. Here, 11 Sept. 1697, the Germans under Prince Eugene, defeated the Turks, a victory which led to the peace of Carlowitz, ratified January 1699. Pop. about 30,000.

Zéolite, a name given to a group of hydrated silicate minerals commonly found in cavities in igneous rocks, from which they are derived through secondary alteration. They include thompsonite, natrolite, scolecite, analcite, chabazite, gmelinite, phillipsite, harmotome, stilbite, and heulandite. The name is derived from the boiling reaction before the blowpipe.

Zephaniah, zēf-ā-nī'ā, the ninth in order of the Scriptural writers known as the minor prophets. His pedigree is traced back for four generations. He is the son of Cushi, the son of Gedaliah, the son of Amariah, the son of Hizkiah, and he is supposed to have been of noble, if not of royal, ancestry. His brief but pregnant prophecy was delivered just after the time of the first appearance of Jeremiah (626 B.C.)—that is, in the first half of the reign of Josiah. The next preceding prophet was Micah, who died in the early part of the reign of Manasseh. But the condition of the whole of western Asia, including Palestine, portended a speedy upheaval. Above all, Nineveh was beginning its memorable decline after the death of its king, Assur-banipal (668-626 B.C.). Morally and religiously the Jewish nation had improved but little since the degeneracy that had followed the death of Hezekiah, and Josiah's reform (621 B.C.) had not yet begun, if we may

judge the invectives of the prophet against idolatrous practices. Zephaniah was apparently a descendant of King Hezekiah.

The Prophet's Message.—Zephaniah spoke and wrote primarily for the correction and warning of Judah and Jerusalem, though he draws illustrations from the sins and fates of other peoples. The culmination of these is found in the iniquities, the pride, and the speedy fall of Nineveh. A division into four parts is as follows:

The threatening: ch. i. 1, the whole world—that is, the Semitic world—is to undergo exemplary punishment, particularly Jerusalem and its apostates from Jehovah (ver. 1-6). (2) The classes of people who are to be thus visited—the royal house, the nobles, the wealthy traders, the careless and defiant generally—are characterized, and their chastisement set forth in language largely figurative (ver. 7-18).

The lessons from the nations: ch. ii. God's own people are warned to repent in time (ver. 1-3), and so avoid the doom that is about to fall upon the Philistines (ver. 4-7), Moab (ver. 8-11), Egypt, under the name of Ethiopia (ver. 12), and finally Assyria and Nineveh (ver. 13-15).

The remonstrance: ch. iii. 1-7. Rebellious and obstinate Jerusalem is urged to repent by the righteous and reasonable God, in view of coming woes; for the lesson of the fate of other nations has so far been unheeded.

The promised redemption: ch. iii. 8-20-1. The faithful remnant is bidden to wait and trust. It shall survive the ruin of the nations, be joined by exiled brethren from far and near, and rest in quiet content (ver. 8-13). (2) Joyous thanksgiving is now in place, for Jehovah is in the midst of Jerusalem, to comfort and bless his people. Their reproach is taken away; dispersion and captivity are at an end.

Zeph'yr, a soft, cool, agreeable wind; in Greece the west, or rather west-southwest wind. The Greek name, according to the etymology, signifies life-bringing, because at the time when this wind begins to blow, the plants are restored to life by the balmy spring air.

Zephyran'thea, a genus of *Liliaceæ*, indigenous to the warmer regions of America, and most commonly represented by the atamasco lily (q.v.). The species are bulbous, and are not hardy in the Northern States, but make charming summer-blooming window and greenhouse plants, resting in the winter. The foliage is linear, springing from the bulb, and a scape, appearing at the same time, is crowned by a regular, 3-merous corolla which is nearly, or quite, erect, from 1 to 3 inches across, and red, yellow, or white in color. *Z. candida* is one of the white-flowered species, and is also one of the hardiest and thriftiest. It is a lovely, crocus-like plant, with pure-white blossoms opening out flat in the sunshine, and evergreen foliage.

Zephyrus, zēf'i-rūs, in Greek mythology, a son of Æolus, or of Astræus and of Aurora, a lover of Chloris or Flora. By the harpy Podarge he was the sire of the swift horses of Achilles, Xanthos, and Balios. His love being rejected by Hyacinthus, he was the cause of his death by blowing Apollo's quail against his head. Some make him the husband of one of the Hours. Flowers and fruits are under his

protection. He is represented as a gentle beautiful youth, naked, with a wreath on his head, or flowers in the fold of his mantle.

Zeppelin, tsép'pè-lín, Ferdinand, Count von, German inventor: b. Constance, Baden, 8 July 1838. He took part in the Franco-German war as an officer of cavalry; arose to the rank of lieutenant-general in the German army; and was attached to the suite of the king of Württemberg. He became known for his experiments in connection with dirigible balloons. His first ascent was on 6 July 1892 at Bern, the balloon safely arriving at Lucerne. On 2 July 1900 he made an ascent at Manzell, near Friedrichshafen, on Lake Constance, in "one of the most ingenious, expensive, and carefully constructed balloons of modern times." This balloon rose 1,300 feet, traveled 3¼ miles in 17 minutes in a prescribed direction, and was finally forced only by an accident to the sliding-weight and one of the rudders to descend, which it accomplished with perfect ease. On 17 October, Zeppelin undertook a second ascent, the balloon on this occasion remaining in the air for an hour at an average height of about 2,000 feet, making noticeable headway and remaining in perfect control against a seven-mile wind. See **Balloons**.

Zeravshan, zér-áf-shān', Asiatic Russia, a river rising in a valley at the junction of the Hissar and Turkestan Mountain chains, and after a westerly by north course of about 400 miles, passing the towns of Penjakent, Samarkand, Katakurgan, Kerminch, and Bokhara, dispersing itself in the desert sands between Karakul and the Oxus River. A railway line traverses the valley from Karakul to near Penjakent.

Ze'rah, a king of Ethiopia, known to the Egyptians as Azekh Amen, who flourished in southern Egypt about 900 B.C. He conquered Egypt and invaded Palestine, where Asa, king of Judah, completely defeated him, as a consequence of which Zerah abandoned not only Palestine, but also Egypt.

Zerbi, Gabriel, Italian physician and anatomist: b. Verona in the 15th century; d. there 1505. After many years of study he lectured for some time at Rome, and became professor of medicine at Padua in 1495. His chief work is 'Anatomy of the Human Body' ('Liber Anatomiz Corporis humani'), published about 1490, which contains the germ of several discoveries in anatomy.

Zerbond di Sponetti, Joseph, German philosopher: b. Breslau 1766; d. 1831. Having written, in 1796, a letter to the governor of Silesia, showing the unreasonableness of attaching an unlimited importance to the right of birth in the nobility, he was imprisoned for three years on a charge of high treason, by order of Frederick William III. Being at last brought to trial he was liberated, and was subsequently employed in several public offices.

Zerbst, tsérpst, Germany, a town in the duchy of Anhalt, on the Nuthe, 21 miles southeast of Magdeburg. The chief buildings are the great Schloss in a fine park; the 15th century Nikolai kirche; and the stately 15th century Rathhaus on the market place where are the

Roland column (1445), and the Butterjungfer, a slender column bearing a female figure. The chief educational institution is the Francisceum, a gymnasium of high repute. The town has manufactures of noted bitter beer, of silks, plush, cloth, leather, machinery, musical instruments, etc. Zerbst was founded in 1007. From 1603 to 1793 it was the capital of a principality of the same name, which in 1797 was absorbed in Anhalt-Dessau.

Zerffi, George Gustavus, English author: b. Hungary 1821; d. Chiswick, England, 28 Jan. 1892. He edited a newspaper at Budapest, and in 1848 served as a captain in the revolutionary army. He also acted for a time as Kossuth's private secretary. On the failure of the revolution in 1849 he came to England and was naturalized, and some years later was engaged as a lecturer in the department of art at South Kensington. Throughout his career Zerffi gave much attention to the subjects of decoration and history, and wrote many works treating these themes in a comprehensive manner. He maintained that history should be studied as a whole on philosophical principles. He planned a general work on these lines entitled 'Studies in the Science of General History' in two volumes, dealing with ancient and medieval history respectively. Among his other publications are: 'A Manual of the Historical Development of Art, with Special Reference to Architecture, Sculpture, Painting and Ornament' (1876); and an English version of Goethe's 'Faust' with critical and explanatory notes (1859).

Zeri'ba, or Zaree'ba, a temporary military enclosure, the sides of which are formed of prickly brush wood, sheltered by which a force may camp comparatively safe from sudden surprise. The term came into prominent use during the Anglo-Egyptian campaign of 1884.

Zermatt, tsér-mät', or zér-mät', Switzerland, a mountain village and tourist-resort in the canton of Valais, at the foot of the Matterhorn and near the head of the Visp Valley, 22½ miles by rail southwest of Visp. It stands 5,315 feet above sea-level, having to the south the great Théodule glacier, above which tower the Breithorn on the east, and beyond the Monte Rosa group, and on the west the rocky cone of the Matterhorn. An electric mountain railway connects with the Riffelberg and the summit of the Gornergrat (10,290 feet). The Théodule Pass or Matterjoch (10,899 feet) leads to Aosta in Italy. In the village churchyard are the graves of many victims of mountaineering. Pop. about 1,000.

Zero, in mathematics, the absence of magnitude; the remainder that is obtained when any quantity is subtracted from itself; nothing, considered as a quantity; that which separates real positive quantities from real negative quantities. Zero is denoted by the symbol 0 ("cipher"), and this symbol itself is often called "zero." In the theory of functions, any value of a variable which reduces a given function of that variable to zero is called a "zero" of the given function. In infinitesimal analysis, infinitesimal quantities are sometimes called zeros. This usage is incorrect, and it leads to confusion of thought. An "infinitesimal" has an actual magnitude, and although that magni-

tude is smaller than any quantity that can be definitely stated or assigned, the fact that it exists distinguishes the infinitesimal from zero, properly so-called.

In physical measurement, the "zero" of any scale is the starting point from which measurements on that scale are reckoned. In thermometry (q.v.) it is customary to distinguish three different kinds of zeros. These are, respectively, (1) the arbitrary zero, (2) the "natural" zero, and (3) the "absolute" zero. The arbitrary zero on such a scale is a zero that is selected arbitrarily, as a convenient point of reference; the selection being governed by practical considerations of convenience, or by the facility with which the point can be experimentally determined. (See **THERMOMETRY**.) The "natural" zero is employed chiefly in connection with the gas thermometer. In a gas thermometer in which the temperature is indicated by the expansion of a given volume of gas at constant pressure, the "natural" zero is the temperature at which the volume of the gas would just vanish, if the contraction of the gas were to follow, at very low temperatures, the law of variation with temperature that prevails between the freezing and boiling points of water. Similarly, in a gas thermometer in which temperature is measured by the change in pressure of a mass of gas that is confined at constant volume, the "natural" zero is the temperature at which the pressure of the gas would just vanish, if the law of variation of pressure were the same, at very low temperatures, as it is between the freezing and boiling points of water. The "natural" zeros of the various gas thermometers that are in actual use are not identical, but their positions differ only by a few degrees, at the most.

The "absolute" zero of temperature is the temperature that a body would have, if it were absolutely deprived of heat; and this "absolute" zero is identically the same for all substances. It happens that the "absolute" zero has nearly the same position on the thermometric scale as the "natural" zeros of the various gas thermometers that are in use, and this fact has led to a great deal of confusion in popular and semi-scientific writings upon the subject of temperature, the "natural" and "absolute" zeros being very commonly confounded with one another. The "absolute" zero is slightly lower than the "natural" zero of any gas thermometer that we know of, with the possible exception of the "natural" zero of the hydrogen thermometer. There is some reason for believing that the "natural" zero of the normal hydrogen thermometer (whether at constant volume or at constant pressure) is a few hundredths of a centigrade degree lower than the true "absolute" zero. If further research bears out this opinion, then it is plain that the "natural" zero of the hydrogen thermometer can never be attained; for the "absolute" zero, being the temperature corresponding to absolute cold, is the lowest temperature that can possibly have a real existence. On the absolute centigrade scale, the temperature of the "absolute" zero is approximately 273.10° below the freezing point of water. This estimate is probably in error by a few hundredths of a degree. There is no theoretical reason why the position of the "absolute" zero cannot be determined to the thousandth of a degree; but the experimental data

required for such a determination are not yet available. See **THERMODYNAMICS**.

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Zer'rahn, Carl, American musical conductor: b. Maichow, Mecklenburg, 28 July 1826. In 1848 he came to America and six years later became director of the Handel and Haydn Society of Boston. He was conductor of the Harvard Symphony concerts 1861-82, and for several years was a successful director of famous musical festivals throughout New England.

Zerubbabel, zē-rūb'ā-bēl, leader of the first band of Israelitish exiles returning from Babylon. His name in the Captivity was Sheshbazzar. He was the recognized prince of Judah, and on arrival at Jerusalem, with Jeshua, the high-priest, directed the renewal of public daily worship and of festival days, and in the second month of the second year of the return, the reconstruction of the Temple. This last work was stopped by their foes and revived only after 16 years, when it was again undertaken and finally completed by Zerubbabel and Jeshua.

Zeta, zē'tā, a small closet or chamber; applied by some writers to the room over the porch of a Christian church, where the sexton resided.

Zet'land Islands. See **SHETLAND**.

Zeuglodon, zē'glō-dōn, a gigantic fossil cetacean mammal, found in the Eocene and Miocene strata of the southern United States and Europe, so named by Owen from the yoke-like character displayed by a section of the molar teeth. Its remains were first discovered in 1834 in the Tertiary of Louisiana, and were supposed to belong to some reptile, to which Dr. Harlan gave the name of *Baniosaurus*; but Owen showed that it was a mammal, and belonged among cetaceans. A few years later a German collector named Koch collected great quantities of the bones and stringing them together in some semblance of a natural skeleton, constructed a "sea-serpent," mostly neck and tail, no less than 114 feet long, which was exhibited widely in America and Europe, and required the exertions of eminent men (for example, Wyman, 'Proc. Boston Soc. Nat. Hist.,' November 1845) to expose as a humbug. The form was probably cetacean, though slender, elongated, and more snake-like, with small anterior limbs in the shape of paddles, and no hind limbs; the skin was supplied with an armor consisting of small irregular bony plates more or less fused together. The skull in some specimens was nearly a yard in length. It is well constructed, the blow-hole in the middle of the face, and the brain-cavity. The teeth are limited in number and disposed in three series as incisors, canines, and molars; the molars are double-rooted, and have serrated crowns. Much discussion has occurred as to the affinities of this great sea-beast, whose characters are so generalized, and period of existence so early that it is now agreed to be a representative of the most primitive *Cetacea*, and is set apart as a family, *Zeuglodontidae* constituting a primitive order *Archaeoceti*. Consult Woodward, 'Vertebrate Paleontology' (New York 1898); Zittel-Eastman, 'Text-Book of Paleontology,' Part III.

Zeugma, *zēgma*, the connection of one word with two words or with two clauses, to both of which it does not equally apply; so that, for one of them, another word (to be gathered from the sense of the passage) must be mentally supplied. Zeugma is therefore a species of ellipsis; both abbreviate discourse. Where the word to be supplied is a form of another in the sentence, as "I love you, and you [love] me," the construction is elliptical; where the sense requires a different word, as "The sun shall not burn thee by day, neither the moon [injure thee] by night" (Ps. cxi. 6, Prayer Book), it is zeugma.

Zeus, *zēs* (Greek *Zeus*), in Greek mythology, the chief of the gods. He was the son of Cronus and Rhea. According to the myth Cronus was in the habit of swallowing his children immediately after their birth. When Zeus was about to be born Rhea consulted Uranus and Gaia as to how he might be saved, and they sent her to Crete (the Trojan Ida and other places are mentioned in other accounts) to be delivered. She concealed Zeus in a cave in Mount Ida, and gave Cronus a stone wrapped up in a cloth to swallow. The infant Zeus was tended by the nymphs Ida and Adrastea; he was supplied with milk by the goat Amalthea, and the bees gathered honey for him. When he had reached manhood, by the aid of Gaia or Metis he persuaded his father to restore to the light the children he had swallowed. Zeus now united with his brothers to dethrone his father, a change of government which led to a war with the Titans. This struggle was not terminated until Zeus delivered the Cyclopes, sons of Uranus and Gaia, who had been bound by Cronus, and who in return provided him with thunder and lightning, and also liberated the hundred-handed beings Briareus, Cothus, and Gyes, who likewise lent him their aid. Having vanquished the Titans, the other children of Uranus and Gaia, he shut them up in Tartarus. Tartarus and Gaia now begot another monster, Typhoeus, who engaged in a fearful struggle with Zeus, but was finally vanquished by a thunderbolt. Zeus now obtained the dominion of the world, which he divided by lot with his brothers Poseidon (Neptune), who obtained the sea, and Hades (Pluto), who received the lower world. Zeus himself possessed the heavens and the upper regions, while the earth was held as common property. Another dreadful war was now waged against the Olympian gods by the giants who were sprung from the blood of Uranus. In this struggle the gods were assisted by Athene, Apollo, Heracles, and other children of Zeus, and the giants were completely vanquished. Zeus had three sisters as well as three brothers, namely, Hestia (Vesta), Demeter (Ceres), and Hera (Juno). He first married Metis, a daughter of Oceanus and Tethys; but as Fate had prophesied that she should bear a son who should rule the world, Zeus swallowed her when she was with child, and Athene subsequently sprung from his head. As his second wife he took for a time Themis, daughter of Uranus and Gaia, but his final and best beloved wife was his sister Hera, by whom he had Hebe, Ares, and Hephaestus. Zeus was regarded as the founder of law, order, and authority, the avenger of wrongs, the punisher of crime, the rewarder of good actions, the source of prophetic

power, the author of all good things, and, in short, as the omnipotent, all-wise, and benevolent ruler of the universe. He was especially looked upon as the controller of all the phenomena of the heavens, and was constantly spoken of as the "Cloud-gatherer" or the "Thunderer." Notwithstanding his general character of wisdom and benevolence, his conduct was anything but immaculate. The incongruity struck some of the ancients themselves, and led to protest against such stories being believed. There appear to have been various local gods of the same name, with various attributes and legendary histories, who were finally merged in the national Hellenic Zeus; traces of the original traditions, however, remained in the local rites of particular localities. An Arcadian and a Cretan Zeus are particularly distinguished. The former had a temple at Mount Lycaeus, so sacred that if any one entered it he died within 12 months, while intentional trespassers were stoned to death. In Crete there were many places sacred to Zeus, who had passed his early life there, particularly Mount Ida and the district around it. Zeus also landed on the island at Gortyn in the shape of a bull, when he carried off Europa, and was worshipped there by the surname of Hecatombeus. The national god was worshipped by sacrifices of bulls, cows, and goats. Two of the principal localities where his worship was carried on in Greece were Athens and Olympia. At the latter place the Olympic games, the most splendid festival in Greece, were held in his honor. (See OLYMPIC GAMES.) Here there was a magnificent temple and a gold and ivory statue of the god, the work of Phidias, and reckoned one of the seven wonders of the world. In representations of Zeus the attributes in connection with him are the eagle, the sceptre, and the thunderbolt. Consult Preller-Robert, 'Griechische Mythologie' (1887).

Zeuss, *tsois*, Johann Kasper, German philologist and historical scholar: b. Vogtlandt, near Kronach, in Upper Franconia, 22 July 1806; d. there 10 Nov. 1856. He was educated in Munich, and became professor of history in the lycée at Bamberg (Upper Franconia). He wrote several valuable books—'Die Deutschen und die Nachbarstämme' (1837); 'Die Herkunft der Bayern von den Markomannen' (1839); 'Traditiones Possessionesque Witzzenburgenses' (1842); 'Die Freie Reichstadt Speier vor ihrer Zerstörung' (1843). But his greatest work was 'Grammatica Celtica' (1853; 2d ed., by Ebel, 1868-71), a pattern of scholarship and thorough method, in which he really founded the science of Celtic philology.

Zeuxippus, *zēk-sip'ūs*, one of the eight successors of Anaximander (q.v.) in the last school of Greek skeptics. Of him, as of all the others with the exception of Sextus Empiricus (q.v.), nothing further is known. Consult Zeller, 'Outlines of the History of Greek Philosophy' (trans. Alleyne and Abbott, 1886).

Zeuxis, *zēk'sis* (Greek *Zeuxis*), ancient Greek painter. He was a native of Heracleia, but which town of that name was his birthplace is not certain. He was born about the middle of the 5th century before Christ, and flourished about the end of the 4th century B.C. He is said by some authorities to have studied under Demophilus of Himera, by others under

Nessus of Thasos. He also studied at Ephesus. Aristotle says that an elevated conception of character was wanting in his work, while Cicero praises him along with Polygnotus and Timanthes for *forma et linamenta*. He learned from Apollodorus the treatment of light and shade, which he greatly developed, and from Phidias to take Homer's descriptions of his heroes as ideal models and to paint them with limbs larger than the ordinary human proportion. One of his most famous works was a picture of Helen for the temple of Hera at Croton. The rivalry of Zeuxis and Parrhasius is represented in a well-known story about a contest in which Zeuxis painted grapes at which the birds pecked, and Parrhasius a curtain which Zeuxis wished to have raised in order to see the picture. Some of his later works he gave away as being valuable beyond any fixed price. As far as may be judged from extant accounts, he painted small works on panels in contrast to the large mural paintings of Polygnotus. It is of course now impossible to form a correct idea of his art, though more anecdotes are told of him than of any other painter of antiquity. These are to be found in Lucian, Cicero, and especially the 'Historia Naturalis' of Pliny.

Zevcot, zäv-kö, Jacques (ZEVCOIUS), Dutch poet: b. Ghent 1604; d. 1646. For a time he was a barrister, but subsequently he became a friar of the rule of St Augustine, and wrote Latin verse which made him widely and favorably known. He visited Rome in 1624 and declined flattering offers of preferment from Pope Urban VIII. In 1605 he made open profession of Protestantism, and later was appointed professor of history and eloquence in the University of Harderwijk (Gelderland). Certainly in the Netherlands, if not beyond, he was esteemed the best Latin poet of his time. The best edition of his verse is 'Jacobi Zevcotii Poematum Editio Ultima' (1740).

Zeyer, ts'ér, Jules, Czech author: b. Prague 1842. After travel in France, Germany, Italy, Greece, and Russia, he became an instructor in the last, and published a number of volumes highly rated in literature. In prose these include 'Count Xavier,' and 'Andrew Cernysev,' the period of which is that of Catharine II.; in verse, 'Vysehrad,' a series of epic poems, the subjects of which are derived from the early history of Bohemia.

Zezschwitz, ts'etsh'viah, Gerhard von, German Lutheran theologian: b. Bautzen (Saxony) 2 July 1825; d. Erlangen 20 July 1886. Educated in the University of Leipzig, he became pastor at Grosszschocher (near Leipzig), but subsequently passed from a lectureship in the university to an extraordinary professorship there. Still later he held chairs in Giessen (from 1865) and Erlangen (from 1866). He was in his time an authority in the department of practical theology. A full list of his volumes cannot be given here; but they number such solid compendiums as 'System der Christlich-Kirchlichen Katechetik' (1863-72; 2d ed. of Vol. II. 1872-4); 'System der Praktischen Theologie' (1876-8); and 'Die Christenlehre im Zusammenhang' (2d ed. 1883-6). Consult 'Zur Erinnerung an Gerhard von Zezschwitz' (1886).

Zhob, zhób, Northwest India, a river of Lewistan, British Beluchistan, which joins the Gomul northwest of the Suliman Mountains, and with it flows into the Indus near Dera Ismael Khan. The Gomul and the Zhob valleys—the latter of which was annexed by Great Britain in 1889—are passes into Afghanistan of strategical value.

Zhukovskii, zhoo-köf'ski-i, Vasilii Andreievich, Russian poet: b. government of Tula, Russia, 29 Jan. 1783; d. 12 April 1852. He served in the campaign of 1812 against Napoleon, later settled in Dorpat, in 1816 obtained an imperial pension, and in 1826 became tutor to the Tsarevitch, later Alexander II. His most important service to Russian literature is to be found in his translations of the poems of Byron, Gray, Moore, Scott, Goethe, Schiller, Rückert, and others; 'Don Quixote'; the 'Odyssey'; and various further foreign classics. Among his original verses, 'Liudmilla,' an imitation of Bürger's 'Lenore,' and 'The Minstrel in the Russian Camp' were the most successful. Examples of them were turned into English verse in Bowring's 'Specimens of the Russian Poets' (1821-3).

Ziegenbalg, ts'g'én-bälg, Bartholomäus, German missionary: b. Pulsnitz (Saxony) 24 June 1683; d. Tranquebar (Coromandel coast) 6 March 1719. He obtained a university training at Halle, and in 1705 sailed from Copenhagen for Tranquebar in response to the call of Frederick IV. of Denmark for missionaries to the Danish possessions in India. He compiled a grammar of Tamil and two lexicons, and translated the New Testament and the Pentateuch. His labors were effective despite much opposition. He was the first Protestant missionary to India. Consult: Germann, 'Ziegenbalg und Plutzschau' (1868); and Plitt, 'Kurze Geschichte der Lutherischen Mission' (1871).

Ziegler, ts'g'lér, Friedrich Wilhelm, German actor and dramatist: b. Brunswick 1750; d. Pressburg 21 or 24 Sept. 1827. He first appeared in 1784 at Vienna, and from that time until his retirement in 1822 he was connected with the Court Theatre there, holding excellent place. Of his many dramatic works, the comedy 'Die Temperamente' and the drama 'Parteiwuth' were among those of less ephemeral value.

Ziegler, Karl, Austrian poet: b. Saint Martin, Upper Austria, 12 April 1812; d. Vienna 20 May 1877. He studied at the University of Vienna, was in the government service from 1835 until his retirement in 1857, and subsequently devoted himself to literature. He contributed largely to the literary periodicals and 'annuals' of the time, and under his pseudonym of 'Carlopagio' published a collection of 'Gedichte' in 1843. His other volumes were 'Himmel und Erde' (1856); 'Oden' (1866); and 'Vom Kothurn der Lyrik' (1869). His verse is simple and original in quality, and was once extremely popular, especially in literary circles.

Ziegler, Theobald, German philosopher: b. Göppingen, Württemberg, 9 Feb. 1846. He studied in Tübingen, from 1871 was an instructor in various gymnasia, in 1884 was appointed lecturer on philosophy and pedagogy in the University of Strasburg, and in 1886 professor there. His 'Sittliches Sein und Sittliches Wer-

den' (2d ed. 1890; English 1892) was a substantial enrichment of the literature of moral philosophy, and the 'Geschichte der Ethik' (2d ed. 1892) is also a work of importance. His further volumes include: 'Religion und Religionen' (1893); and 'Fr. Th. Vischer' (1893).

Ziegler, William, American capitalist: b. Beaver County, Pa., 1 Sept. 1843; d. Stamford, Conn., 24 May, 1905. He at first entered the printers' trade, and in 1868 the bakers' and confectioners' supplies business. In 1870 he organized the Royal Chemical Company, which he developed into the Royal Baking Powder Company, retiring from active business in 1886. He also operated largely in real estate. He fitted out the Ziegler expedition to explore the Arctic by way of Franz Josef Land, and, if possible, reach the North Pole. The expedition, Commander Fiala, left Vardö, Norway, 10 July 1903, and was not heard from thereafter.

Ziegler und Klipphausen, oont klîp'howzên, Heinrich Anselm, German poet: b. Radmeritz, Upper Lusatia, 6 Jan. 1663; d. Liebertwolkwitz, near Leipsic, 8 Sept. 1696. He was educated at Frankfurt-on-the-Oder, and lived as a landed proprietor. His chief work is 'Asiatische Banise, oder Blutiges doch Mutiges Pegu' (1688), which continued to appear in successive editions as late as 1764. It was reprinted, under Felix Bobertag's supervision, from the third edition (1707), in Vol. 37 of Kürschner's 'Deutsche Nationalbibliothek'. The work is done in a turgid style, but met in its day a great success, and had in Germany considerable literary influence. Its author's further writings are of less significance.

Ziem, zêm, Félix, French artist: b. Beaune (Côte d'Or) 25 Feb. 1821. He studied in the art-school of Dijon, traveled in southern France, Italy, and the Orient, obtained a third-class medal at the Salon of 1851, a first-class in 1852, and became well known for his landscapes, particularly for scenes of Venice. Among his many canvases are: 'View of Venice' (1852; Luxembourg); 'The Bank of the Amstel' (Bordeaux Museum); 'Quai Saint-Jean at Marseilles' (Marseilles Museum); 'The Doge's Palace' (Ravené Gallery, Berlin); and several in private collections in the United States.

Zieriksee, zê'rik-zâ, Netherlands, a town in the province of Zeeland, and the chief town of the island of Schouwen, three miles from the Ooster Schelde, with which it is connected by two canal harbors, and 21 miles east-northeast of Flushing. It has six churches, a fine town-house, and a gymnasium, manufactures madder, carries on brewing and oyster fishing, and has considerable trade and shipping. It is the oldest town of Zeeland, and was formerly an important Hanse town. Its demolished walls are now replaced by promenades. Pop. 7,000.

Ziethen, tsé'tên, or Zieten, Hans Joachim von, German soldier: b. Wustrau, near Neu-Ruppin, Brandenburg, 14 May 1699; d. Berlin 27 Jan. 1786. He entered the Prussian army in 1714, distinguished himself as a colonel in the Silesian campaign of 1742 and as a major-general in that of 1745, and in May 1745 made his celebrated march through the enemy's country in Upper Silesia, in order to communicate with the Margrave Karl at Jägerndorf. In 1756 he was made lieutenant-general. He obtained

his chief renown in the Seven Years' war, winning the victories of Reichenberg, Prague, and Leuthen, and deciding the day at Torgau by storming the heights of Suptitz. He was promoted general of cavalry, and was the most famous of the commanders of Frederick the Great. In the development of the light cavalry service he made important contributions. Consult the biographies by Count zur Lippe-Weissenfeld (2d ed. 1885) and by Winter (1886).

Zif, Ziv, or Ziph, in the Hebrew calendar, the second month of the year, extending from the new moon in May to that in June; or, according to some rabbis, from the new moon in April to that of June.

Zileh, zêl-lê', or Zile, ancient Zela, Asiatic Turkey, a town in the vilayet of Sivas, 25 miles southeast of Amassa. It is built on a hill, the mound of Semiramis mentioned by Strabo; a modern castle occupies the site of an old Byzantine fortress. Ancient Zela was a theocracy ruled by the priests of the temple of Anaitis. Pop. 20,000.

Ziller, tsîl'lêr, Tuiaken, German educator: b. Wasungen, Saxe-Meiningen, 22 Dec. 1817; d. Leipsic 20 April 1882. He was educated at Leipsic, where he was at first a lecturer in jurisprudence, but in 1864 became professor of philosophy and pedagogy. At his initiative the Verein für Wissenschaftliche Pädagogik was founded. Among his books are 'Einleitung in die Allgemeine Pädagogik' (1856; 2d ed. 1901) and 'Allgemeine Philosophische Ethik' (1886; 2d ed. 1886).

Zillerthal, tsîl'lêr-tâl, Austria, a valley of the Tyrol in the eastern Alps, about two miles below Innsbruck, famous for its scenic beauties. It is traversed by the Ziller, which joins the Inn River at the mouth of the valley. It is much frequented by tourists, a railway line connecting with Mairhofen in the valley.

Zimbabwe, zêm-bâb'wâ, or Zimbabwe (Bantu for 'here is a great kraal'), a name applied to numerous interesting South African ruins in Rhodesia and the Transvaal. The best known and most important is the Great Zimbabwe, near the Sabi River, about 17 miles from Victoria in southern Rhodesia. There are two principal structures at Great Zimbabwe, one on the crest of a granite hill breaking down precipitously to the south, and the other on the level ground about a third of a mile to the south. The lower one is roughly circular or elliptical, enclosed by a wall of 30 or 40 feet high, 14 feet thick at the base, and from 6 to 9 feet thick at the summit. The wall is composed of well-trimmed blocks of granite fitted together without mortar in regular courses, and occasionally set angularly for ornamental purposes. An inner wall runs close to the outer for a considerable distance, forming a passage which leads to a sacred enclosure containing two conical solid towers, the larger of which is some 40 feet high. The rest of the enclosure is divided into irregular chambers, none of which are roofed. The building on the hill is very strongly built for defense, and also contains a sacred enclosure. Phallic emblems, many curious objects in soapstone, and undoubted remains of gold-working utensils have been found in the Zimbabwe. The nearest gold deposits and ancient gold workings are, however, some

miles distant. Some theorists would locate here the Ophir of Solomon. It is generally believed that the lower building was a kind of town occupied by pre-Mohammedan Arabs who came here in search of gold, and that the ruin on the hill was a stronghold for defense. The buildings show distinct signs of orientation. Consult: Bent, 'The Ruined Cities of Mashonaland' (1892); and Hall and Neal, 'The Ancient Ruins of Rhodesia' (1902).

Zimmerman, Eugene, American caricaturist and illustrator: b. Basel, Switzerland, 25 May 1862. After a public school education in Paterson, N. J., and some time in various employments, he turned his attention to comic art, was on the staff of 'Puck' illustrators in 1882-5, and in 1885 became connected with 'Judge.' He also executed illustrations for some of the works of 'Bill' Nye and others.

Zimmerman, Jeremiah, American clergyman and numismatist: b. Snodysburg, Md., 26 April 1848. Graduated from Pennsylvania College, Gettysburg, in 1873, and the theological seminary there in 1876, he was pastor of the Lutheran Church at Valatie, N. Y., in 1877-8, and in 1879 organized at Syracuse, N. Y., the First English Lutheran Church, of which he is still the pastor. He also became a lecturer in Syracuse University. He is regarded as an authority on the historical branch of numismatics. Among his writings is the volume 'Spain and her People' (1902).

Zimmermann, tsim'mër-män, Albert, German painter: b. Zittau, Saxony, 20 Sept. 1808; d. Munich 18 Oct. 1888. He studied in Dresden and Munich, and was made professor in the Milan Academy in 1857 and at the Vienna Academy in 1860. His works display admirable characterizations of mountainous scenery and excellent light-effects. Among them are: 'Rocky Landscape with Centaurs and Leopards'; 'Chiem Lake in Storm'; 'The High Göl'; 'Sunset on Hintersee'; and 'Lake Como'.

Zimmermann, Johann Georg, CHEVALIER von, Swiss philosopher and writer: b. at Brugg, canton of Aargau (then in Bern), 8 Dec. 1728; d. Hanover 7 Oct. 1795. He studied medicine under Haller at Göttingen, and in 1754 was appointed public physician to his native town. He employed his leisure in the publication of pieces in prose and verse, including the first sketch of his popular work 'Ueber die Einsamkeit' (On Solitude, 1756; completely re-written 1784-5). This was followed by his essay 'Vom Nationalstolz' (On National Pride 1758). In 1763 he composed his work 'Von der Erfahrung in der Arzneikunst' (1764), which he followed up by several other professional treatises; in consequence of which he received an offer of the post of physician to the king of England for Hanover, which he accepted, and removed in 1768 to that capital. In 1786 he attended Frederick the Great in his last illness, which afforded little room for medical skill, but enabled him to publish on account of his conversations with that celebrated sovereign, 'Ueber Friedrich den Grossen und meine Unterredung mit ihm' (1788), and 'Fragmente über Friedrich den Grossen' (1789), works of no value. His 'Solitude' was at one time very popular, and was translated into almost every language of Europe.

Consult the studies by Bodemann (1878) and Ischer (1893).

Zimmermann, Wilhelm, German poet and historian: b. Stuttgart 2 Jan. 1807; d. Mergentheim, Württemberg, 22 Sept. 1878. After study at Tübingen, he was connected with various journals at Stuttgart, from 1847 to 1850 was professor of history and of German language and literature in the Polytechnic Institute there, but lost the post through his liberal attitude as a member of the German National Assembly (1848) and the Württemberg parliament. Subsequently he was pastor of Evangelical churches at Leonbronn, Schnaitheim, and Owen. He is best known for his 'Gedichte' (1831; 2d ed. 1839; 3d 1854), which reveal the influence of Schiller and Uhland, but are never merely imitative. Others of his publications are: 'Befreiungskämpfe der Deutschen gegen Napoleon' (1836; 3d ed. 1859); 'Geschichte des Grossen Bauernkriegs' (1841; 2d ed. 1856), and 'Geschichte der Deutschen Nationalliteratur' (1846).

Zimmermann, Helen, English authoress: b. Hamburg, Germany, 25 March 1846. After a secondary education at Bayswater, she became a contributor to 'Once a Week,' 'Old Merry's Monthly,' the *Press*, the *Examiner*, and other periodicals and journals, and in 1876 achieved a success with 'Schopenhauer, his Life and Philosophy.' From 1887 she has resided at Florence, Italy, where she corresponds for Italian, English, and American periodicals. She has also lectured in Italy, England, and Germany, on Italian art. Among her further publications are: 'Gothold Ephraim Lessing, his Life and his Works' (1878); 'The Epic of Kings' (1882), a paraphrase from Firdusi; a 'Life of Maria Edgeworth' (1883); and 'The Hansa Towns' (1889). She also translated from Nietzsche, and Lessing's prose, and edited the comedies of Goldoni (1892).

Zimri, zim'ri, in the satire 'Absalom and Achitophel' (pt. i. 1681; pt. ii. 1682) by John Dryden (q.v.), a character representing Villiers, Duke of Buckingham:

Some of the chiefs were princes in the land:
In the front rank of these did Zimri stand, etc.
(Pt. i. 345 et seq.)

Buckingham was depicted as a factional leader, like Zimri who conspired against Asa, king of Judah (1 Kings xvi. 9).

Zinc, or **Spelter**, a white metal with a bluish gray tint like lead. Its texture is lamellated and crystalline, and its specific gravity about 7. It is hard, being acted on by the file with difficulty, and its toughness is such as to require considerable force to break it when the mass is large. At low or high degrees of heat it is brittle, but between 250° and 300° F. it is both malleable and ductile, and may be rolled or hammered into sheets of considerable thinness and drawn into wire. Its malleability is considerably diminished by the impurities which the zinc of commerce contains. It fuses at 773° F., and when slowly cooled crystallizes in four- or six-sided prisms. Zinc undergoes little change by the action of air and moisture. When fused in open vessels it absorbs oxygen, and forms the white oxide called flowers of

ZINC WHITE

zinc. Heated strongly in air it takes fire and burns with a beautiful white light, forming oxide of zinc. Zinc is found in considerable abundance in Great Britain, Austria, Germany, Belgium, Italy, and in some parts of the United States. It does not occur in the native state, but is obtained from its ores, which are chiefly the sulphide, or zinc-blende, and the carbonate, or calamine. The oxide of zinc (ZnO) is a fine white powder, insoluble in water, but very soluble in acids, which it neutralises, being a powerful base of the same class as magnesia. It combines also with some of the alkalies. Several of the salts of zinc are employed in medicine and the arts; as the sulphate, which is used in calico printing, and in medicine as an astringent, a caustic, an emetic, and a tonic; the oxide and the carbonate, used as pigments, etc. Sheet-zinc is largely employed for lining water cisterns, baths, etc., for making spouts, pipes, for covering roofs, and several other architectural purposes. Plates of this metal are used as generators of electricity in voltaic batteries, etc. Zinc is much employed in the manufacture of brass and other alloys, and in preparing galvanised iron.

Joplin District.—The centre of the zinc industry in the United States is at Joplin, Mo. (q.v.), and the purity of the sulphide ores of the Joplin District has made it famous the world over. Most particularly is this true in relation to the sulphide zinc ores. There is no other known territory of like area in the whole world where sulphide zinc ores are mined with so high a per cent of metallic contents. The ideal state of sulphide zinc ore is 66½ per cent metallic zinc and 33½ per cent sulphur. Ores have been assayed here carrying 66½ per cent metallic zinc, and the average of the district output seldom falls below 58 per cent, returning to the smelter over 50 per cent metal in actual process of recovery, with a very nominal loss in residue. Those smelters provided with a means of recovering sulphuric acid from the sulphur in these ores produce one ton of this acid from every ton of the ore, combining a valuable by-product with the metal recovery. While the average falls as low as 58 per cent, hundreds of tons are marketed each week that assay 60 to 64 per cent metallic zinc contents.

Method of Marketing.—The ore producer places an open bin outside his mill from which the purchasing agents of the various smelters take samples, have them assayed, and, on the result of the assay, base a price in the bin. For the best grades of ore this price is about eight times as much per ton as the price of spelter per hundred pounds in Saint Louis. Weekly cash settlements are made for all ore purchased averaging in 1904 \$11,000 per week.

Ore Deposits.—Zinc ore is found in three distinct deposits—cavernous, disseminated and in blanket or horizontal vein.

Ore Occurrence.—Cavernous deposits were the original form of discovery, occurring near the surface. Deeper mining discovered disseminated deposits in some sections of the district, and blanket or horizontal vein deposits in other sections. The depth of ore occurrence in the discovery period of the district was at or near the surface. Mining is now in operation on the 175 to 250 foot level with a few mines being opened on the 300-foot level. Compared with other mining districts this is considered

still the surface level. The existence of ore deposits on still lower levels has been demonstrated by the churn drill, the lowest level tested being 1,100 feet.

Future of the Industry.—With known ore deposits on the 1,100-foot level, and the history of the old world mines, operating at these deep levels, gives an unlimited future to the mining of zinc ore in the Joplin district. The infancy of the industry in this district could be demonstrated by no stronger illustration than the difference in the working levels here and in the Old World zinc mines. Each decade marks a gradual deepening of the workings here about 100 feet deeper each decade.

Ore Formations.—In addition to the large amount of sulphide of zinc produced here, there is a lesser production of silicate of zinc, and a minor production of carbonate of zinc. In some mines of the district these ore formations occur alone, and in a number of mines they are associated with lead. The lead of this district occurs in the same three formations, and is proportioned in quantity with the sulphide leading, the silicate next and a small amount of carbonate. The output of lead in tonnage is practically one-tenth that of zinc.

Methods of Mining.—The district has progressed from the crudest to the most modern methods since the war of the rebellion. In the earliest stages of mining the ore was thrown out at first with a shovel, then a hand windlass, similar to the old well windlass, then came the horse hoist in varying stages of improvement as the depth was increased; steam followed; electricity is being introduced from a central energy plant, located on Spring River, 13 miles southwest of Joplin; natural gas is being piped in from the Kansas gas field.

System of Leasing.—There are five classes interested in the welfare of mining: land-owners, first lessees, sublessees, miners and the commercial interests. The land-owner is seldom a mine operator. That part falls to the first and second lessees. Formerly a first lessee was not an operator until mining operations passed below the 200-foot level. In earlier days the first lessee was a drainage company. With deeper mining the methods are required to be amplified on account of the greater cost. With still deeper mining the mine-operating company will of necessity become the fee holder, to avoid the payment of tribute as royalty from the earnings of the mine.

Commerce.—Four railroad systems at present supply the shipping interests—the Frisco-Rock Island, the Kansas City Southern, the Missouri Pacific and the Missouri, Kansas, & Texas. Aside from the heavy outward shipments of ores, the crushed chert, a refuse from ore concentration, is shipped in large quantities for city streets and for leveling the roadbeds of the railroads. Several factories manufacture hollow building blocks from this chert in combination with cement, a new industry that is rapidly becoming an important factor, in addition to the superior building stone of the Carthage quarries. The inward shipments are coal and timber for the mines, lumber, mining machinery and merchandise, for wholesaling and retail. Vast quantities of fuel are consumed, an important per cent of which will be superseded by the introduction of natural gas and electricity.

ZINC WHITE — ZINZENDORF

Developed Areas.—There exist five chains of development extending from the northwest to the southeast, on what is termed an eleven o'clock range, and one chain extending from the northeast to the southwest on a one o'clock range. The first five begin on the northwest with Badger, Zincite, Central, Jackson, Spring City, Spurgeon and Racine, the next chain to the east comprises Lawton, Lehigh, Mitchell (old Sherwood), Chitwood, Joplin and Saginaw; in the third are Oronogo, Webb City, Carterville, Prosperity, Duenweg, Diamond and Granby; in the fourth are Neck City, Albia, Carthage, Reeds, Wentworth and McDowell; in the fifth Stott City and Aurora comprise all the developments. From Zincite to Cave Springs, Empire Galena and Baxter Springs occurs the one o'clock chain of development. In the third chain is found the blanket or horizontal vein underlying the cavernous deposits. In the fifth chain occur occasional ore channels, or extended cavernous deposits. Occasional irregular connections occur between these slightly separated eleven o'clock ranges. Chitwood and Joplin have the largest development of disseminated ores. The entire area embraces about 25 to 35 miles in extent.

Historical.—Lead mining alone was prosecuted here prior to the war of the rebellion. The mining of this mineral was confined to Granby, Minersville (now Oronogo), Leadville hollow (now Joplin), and east and west hollow of the Stevens Diggin's (now Zincite). Silicate of zinc was found in great abundance with the Lead of Granby, but was put aside with no demand. The first demand for silicate of zinc was in 1871, when less than 1,000 tons were marketed. By 1883, the first year that sulphide of zinc ore was marketed, the output had grown to 53,900 tons, mostly silicate. The next decade, 1893, marked almost a complete change, with an output of 134,090 tons, mostly sulphide. An increase of nearly 100 per cent was recorded in 1907, with an output of 223,745 tons, principally sulphide of zinc ore. Two years later, 1909, the output reached 239,225 tons of zinc, with a market value of \$24,864,300 as compared with \$26,401,910 in 1907. JESSE A. ZOOK.

Statistician for the Joplin District.

Zinc White. See WHITE COLORS.

Zincite, a deep blood-red to orange-red mineral found quite abundantly in Sussex County, New Jersey. It is usually in granular or foliated masses, associated with franklinite, willemite, tephroite, and calcite. It rarely occurs in hexagonal, hemimorphic crystals, with perfect basal cleavage. Its hardness is 4 to 4.5 and specific gravity about 5.7. It is an oxide of zinc, ZnO, and is valuable as an ore of that metal. It is often called red 'oxide of zinc.'

Zincography. See LITHOGRAPHY.

Zingarelli, dzén-gá-ré'lé, *Nicolo Antonio*, Italian composer: b. Naples 4 April 1752; d. there 5 May 1837. He studied at the Conservatorio di Loreto and also under the Abbate Speranza, and on leaving the conservatory received the place of master of the chapel at Torre dell'Annunziata. In 1781 he composed for the Theatre San Carlos, in Naples, his opera 'Montesuma,' and in 1785 brought forward his 'Alzinda' in La Scala, Milan, with great success. In this work he adopted a more simple and easy style. His best operas are 'Pirro,' 'Artaserse,'

and 'Romeo e Giulietta.' In 1789 he brought out his 'Antigone,' from Marmontel in Paris; but the public events then occurring absorbed the attention of the public, and he soon returned to Italy, where he became director of the Vatican chapel. About 1812 he was appointed director of the musical academy of San Sebastiano, and in 1816 chapel-master in St. Peter's. Zingarelli composed much church music, and his works are highly esteemed for their expression. From 1781 he wrote about 40 operas, many melodies from which have continued to be interpolated in modern Italian productions.

Zingerle (von Sommersberg) tsing'ér-lé, *Ignaz Vincenz*, Austrian Teutonic scholar: b. Meran 6 June 1825; d. Innsbruck 17 Sept. 1892. He was a nephew of Pius (q.v.). He studied at Innsbruck and (theology) Brixen, and from 1859 until his retirement in 1890 was professor of German language and literature at Innsbruck. Among his works are: 'Sagen aus Tirol' (2d ed. 1891); 'Sitten, Bräuche, und Meinungen des Tiroler Volkes' (2d ed. 1871); 'Schildereien aus Tirol' (1875-88), and 'Der Bauer von Longvill' (1874).

Zingerle, *Pius*, Austrian Orientalist and Catholic theologian: b. Meran 17 March 1801; d. Marienberg cloister 10 Jan. 1881. He studied at Innsbruck, became in 1862 professor of Oriental languages in the Sapienza at Rome, and in 1867-71 was director of the gymnasium at Meran. Among his works are: 'Ausgewählte Schriften des Heiligen Kirchenvaters Ephraim' (2d ed. 1845-6); 'Akten der Heiligen Märtyrer des Morgenlandes' (1836); 'Chrestomathia Syriaca' (1871); and 'Lexicon Syriacum.'

Zinjan, sín-ján', Persia. See ZANJUN.

Zinnia, a genus of annual and perennial herbs and sub-shrubby plants of the order *Compositae*. The species, of which 16 have been described, are indigenous from southern Colorado to Chile, but are chiefly distributed in Mexico and Central America. They have opposite, generally entire leaves and terminal heads of very variously tinted flowers, for which some of the species have become popular in gardens. The best known species is the garden zinnia or youth-and-old-age (*Z. elegans*), an erect annual usually about 18 inches tall and originally bearing yellow or orange flowers, but now exhibiting nearly every tint except blue and green in both single and double forms, which often exceed three inches in diameter. *Z. haageana* was introduced into cultivation in 1861, but being less showy and smaller than the former is of secondary importance. A hybrid race developed from these two species, and known as *Z. darwini*, has been developed, but has not become widely popular in America. The plants are rather stiff, formal, and coarse in habit, and their colors, although brilliant and metallic, lack the delicacy of the dahlia and the china aster, to which they are not distantly related. They are, however, among the most useful garden annuals, because they will thrive upon almost any kind of soil and yield a profusion of bloom from midsummer until frost.

Zinzendorf, tsín'tsén-dórf, *Nicholas Ludwig*, COUNT VON, German religious leader, founder of the Society of United Brethren: b. Dresden, Saxony, 26 May 1700; d. Herrnhut,

Upper Lusatia, 9 May 1760. From 1716 to 1719 he studied at the orthodox University of Wittenberg, and subsequently traveled in Holland and France, describing his journey in 'The Pilgrimage of Atticus through the World.' In 1721 he received an appointment to the council of state from the Saxon government, which he held till 1727. He then completely withdrew from public affairs. He received at his estate in Upper Lusatia (1722) the persecuted Moravian Brethren. This settlement received in 1724 the name of Herrnhut. With a view to founding the body called the United Brethren (q.v.), he published various projects, not in harmony with each other, which excited opposition, but he persevered in his plan and finally succeeded. In 1734, after passing a theological examination under an assumed name, he was ordained a clergyman of the Lutheran Church. After two years spent in traveling on behalf of his society, he was banished in 1736 from Saxony. The order of his banishment was repealed in 1747. In the meantime he had been consecrated bishop of the Moravian Church in Berlin, founded Moravian colonies in Holland, Esthonia, and Livonia, and visited England. In 1739 he wrote a catechism which he styled the 'Good Word of the Lord,' and the same year visited the missions of the Brethren in the West Indies. In 1741 he founded the well-known Moravian colony at Bethlehem, Pa., and before returning to Germany in 1743 assisted in establishing missions among the Indian tribes. After returning to Europe he made a journey to Livonia, whence the Russian government sent him back under a military escort to the frontier. He afterward visited Holland, spent several years in England, and obtained an act of Parliament for the protection of his followers in the British dominions. He wrote more than 100 works of prose and verse. A collection of his hymns, edited by Knapp, appeared in 1845. Consult the 'Lives' by Spangenberg (1773-5; Eng. trans., abridged, 1838) and Römer (1900); also, Plitt, 'Zinzendorf's Theologie' (1869-74), and Becker, 'Zinzendorf und sein Christentum im Verhältnis zum Kirchlichen und Religiösen Leben seiner Zeit' (2d ed (1900).

Zi'on, or Zion, the loftiest mount of Jerusalem, and often used to designate the whole city, and metaphorically the kingdom of God on earth and in heaven. Zion rises about 2,500 feet above the Mediterranean, and from 200 to 300 feet above the valleys at its base. It was separated from Akra on the north and Moriah on the northwest by the Valley Tyropoeon; and had the valley of Gibbon on the west, that of Hinnom on the south, and that of the Kidron on the southeast. It was a fortified town of the Jebusites till subdued by David, and thenceforward was called the 'City of David.' A mosque near its southern brow now covers the 'tomb of David' so called. This mount, together with Moriah and Ophel, was enclosed by the first wall, and fortified by citadels. On it were erected the palaces of Solomon, and long afterward those of Herod. At the present day a considerable portion of it lies outside of the modern wall on the south.

Zi'onism, a name given to a scheme for the acquisition of Palestine by purchase from Turkey, with a view to establishing Russian and other Jews in the Holy Land. A Zionist

Congress with this end in view opened at Basel 29 Aug. 1897; and again 28 Aug. 1898. About 200 European delegates were present. The financial instrument of the Zionists is the Jewish Colonial Trust, Ltd., of London, capitalized at \$10,000,000, of which \$1,400,000 has been paid in. In the United States the Zionist organization is called the Federation of American Zionists, and has 165 affiliated societies, and about 10,000 members. See JUDAISM — ZIONISM.

Zipaquira, sè-pà-kè-rà', Colombia, town, department of Cundimarca, 25 miles north of Bogotá. It is built on the site of an old Chibcha Indian town, which was the residence of the chiefs or *Zipas*. It is especially noted for its valuable salt bed which is owned and operated by the government, and supplies the greater part of the salt used in the republic. Coal and iron are also found in the vicinity; and the town carries on an active trade with the surrounding district.

Ziph. See ZIP.

Zir'con, the native zirconium silicate, $ZrSiO_4$. Its crystals are tetragonal and isomorphous with thorite, xenotime, cassiterite, and rutile. Though its crystal forms are very varied, they are usually prisms terminated by pyramids, the base being rare. Small crystals frequently show a wealth of faces, among which the "zirconoids" or ditetragonal pyramids are prominent. It is a heavy mineral, its specific gravity averaging about 4.7, and it has a characteristic greasy-adamantine lustre. Though often nearly or quite opaque, transparent crystals are not uncommon, and owing to its hardness, 7.5, strong double refraction and the variety of rich colors in which it is found, zircon has long been prized as a gem. Its dispersive power is excelled only by the diamond. "Hyacinth" or "jacinth" includes reddish, orange, or brownish gem stones, while "jargon" embraces the colorless, yellowish, grayish, or smoky varieties. It is often an important accessory constituent of gneiss, syenite and many crystalline rocks. Because of its resistance to weathering and abrasion it frequently occurs in fine little crystals in alluvial sands as in Ceylon, Brazil, and the monazite region of North Carolina. The finest zircon gems come from Ceylon and New South Wales, while France yields very small stones of remarkably fine red color. Excellent translucent to opaque crystals occur in Norway, the Ural Mountains, Canada (up to 15 pounds), in New York, New Jersey, Colorado, and North Carolina. By far the most important locality is in Henderson County, North Carolina, where many tons of crystals occur loose in the soil. Zirconia, derived from this source, was used in the 'Welsbach' or 'Auer' mantles, but its incandescence had not sufficient permanency and its use has been superseded by thorium. Zirconia is still useful as a refractory material in furnace and crucible linings, and because of its incandescence in the "zircon light," which is an improvement on the ordinary lime light.

Zirconium, a chemical element named after the mineral zircon in which Klaproth discovered the oxide zirconia (1789). Afterward found in many other minerals, some of the most important being endialyte, hyacinth, polymignite, etc. It has many physical and chem-

ical properties resembling the element silicon. Like silicon and carbon it exists free in three allotropic forms; the amorphous, obtained as a black powder by heating sodium zirconium chloride with metallic sodium or potassium; the crystalline, as foliated leaves from heating sodium zirconium fluoride with metallic aluminum; and the graphitoid, obtained in scales of a steel gray color by action of iron on sodium zirconium. Symbol Zr; atomic weight 90.7; specific gravity 4.15. The element is only slightly soluble in hydrochloric or sulphuric acids, but is really so in aqua regia or hydrofluoric acid. When heated highly in the air it burns to the oxide ZrO_2 . This oxide, commonly known as zirconia, is prepared by fusing the mineral zircon ($ZrSiO_4$) with a mixture of sodium hydrate and sodium carbonate, treating with hydrochloric acid and heat to separate the silica, precipitating the solution so obtained with ammonia, and heating this white precipitate. Another method is now used by which the chloride is made by treating crushed zircon with chlorine, separating the silicon chloride by heat, precipitating the solution of zirconium chloride with ammonia, and heating the precipitate. Zirconia forms a white powder or amorphous lumps. It has both basic and acid properties. It dissolves slowly in hydrofluoric or sulphuric acids, the fluoride (ZrF_4) uniting with fluorides of other metals forming complex salts called zirconofluorides, example K_2ZrF_6 , potassium zirconofluoride. With strong alkalis zirconia forms zirconates, example, K_2ZrO_4 , potassium zirconate. Zirconium forms a long series of salts, in most of which it acts as a basic element.

Uses.—Zirconia possesses the power of being extremely refractory toward heat, not being changed even by that of the oxy-hydrogen blowpipe flame. It also has great radiating power. Because of this it is used in the "zirconia light," a light used considerably in lighthouses. A cone of zirconia is played upon by the very hot flame of the oxy-hydrogen blowpipe so that it glows with a very intense white light. While this is the principal use of compounds of zirconium, certain minerals containing it are found as clear beautiful stones and are used as gems.

Zirknitz, tsirk'nitz, Austria, a phenomenal lake in Carniola, 30 miles east-northeast of Trieste, in a deep valley surrounded by mountains, the principal of which are Javornik, Succhi, Slivinja, and Sternitz. The lake takes its name from Zirknitz, situated at an elevation of 3,500 feet, and one of many villages in the neighborhood. Receiving the waters of six streams, and surrounded by mountains with no outlet, the characteristic feature of the lake is its internal drainage. The bottom of the lake partakes of the limestone formation of the district, which fissures readily, and has numerous subterranean caves and channels. Some of these caverns are of great depth, and in the dry season absorb the waters of the lake, leaving it sometimes completely dry, with only a few pools, in which the fish take refuge. A luxuriant natural vegetation covers the surface of the deserted lake, and when the drought is protracted grass, millet, or buckwheat is sown on it and the harvest reaped before the return of the water. In June the lake is frequented by wild ducks, which afford abundant sport, and when

the water is decreasing fish are caught in great numbers. The lake is from six to seven miles long, nearly three broad, and of an average depth of 11 feet, but there is no stated limit to its basin. It receives the drainage of a considerable country, and even when no rain falls in the immediate neighborhood its reservoirs are filled from the rainfall of more distant hills. In dry seasons the lake takes about 30 days to empty. When rain has been abundant, and all its subterranean sources are in simultaneous activity, it reaches the average height in 72 hours, and when the rain has extended to all the tributary region it reaches its extreme level, which is about two feet above the average, in 196 hours. The natural outlets then no longer suffice to carry away the water, and it overflows the country, damaging or destroying the surrounding villages. The emptying and flooding of the lake depends upon the drought or moisture of the season, and is not strictly periodic. It has been known to empty and fill three times in one year. From 1707-14 it was only once dry, and from January 1834 to February 1835, it remained entirely without water, the longest drought on record. This lake was known to the ancients for the same phenomena, and it has been picturesquely described by Tasso in his 'Sette Giornate del Mondo.'

Ziska, zis'ka (properly **Ziška, zhižh'ka**), John, Bohemian Hussite leader: b. Trocznov, near Budweis, about 1360; d. Píseňslav 11 Oct. 1424. He was educated at the court of King Wenceslas at Prague, entered the profession of arms, joined the contingent that went from Bohemia and Hungary in 1410 to the assistance of the Teutonic Knights against the Poles and Lithuanians, and fought with great prowess in the fiercely contested battle of Tannenberg (15 July 1410). Then he served in Hungary against the Turks, and on the English side at Agincourt (25 Oct. 1415). Soon after the execution of Huss (q.v.), he returned to Bohemia and became a leader of the Hussites. In 1419, when the Hussites broke into rebellion against the Emperor Sigismund, Ziska organized their military forces into a well-disciplined army of infantry, supplying the want of cavalry by means of the *Waggenburgen*, or "cart-forts," constructed of the baggage-wagons. He took up his headquarters at a stronghold on the heights of Austie, in southern Bohemia, the fortress being known as Tabor (with reference, perhaps, both to *tabor*, Bohemian for "encampment," and to Mt. Tabor in Palestine), and the extreme Hussites as "Taborites." Sigismund sent an army of 30,000 into the country, but Ziska, with a hasty levy of about 4,000 took up his position on Mt. Vitkov, near Prague, and on 14 July 1420 defeated the enemy with great slaughter. The eminence has since been known as the Hill of Ziska. On 1 Nov. 1420, at Pankratz, he was again victorious over Sigismund, and on 2 November captured the fortress of Vyšehrad, near Prague. He won a second great battle against Sigismund 8 Jan. 1422 at Deutschbrod, and penetrated into Moravia and Austria. He had long had but one eye, and had lost the other by an arrow-wound at the siege of Raby castle, but he continued to direct his troops with great efficiency and almost unvarying success. Prague

refused to recognize his authority, and he thoroughly subdued it in 1424. In that year, it is said, Sigismund, realizing the impossibility of conquering Bohemia, began negotiations toward a treaty, by the terms of which the Hussites were to have full religious liberty and Ziska was to be governor of Bohemia. Such negotiations, if undertaken, were interrupted by Ziska's death at the siege of Pflav. Ziska became the hero of the Bohemian revolutionary party, and for this character he was well fitted by his zeal and military ability. He was frequently cruel in his method of warfare and conquest. Much fiction has been mingled with the facts of his career. Alfred Meissner's epic 'Ziska,' based on the leader's history, reached a 12th edition in 1884. Consult the German translation (1882) of Tomek's 'Life.'

Zith'er, a modern development of the musical instrument known to the Greeks as cithara. In the early part of the 19th century it became a favorite with the peasantry of the Styrian and Bavarian Alps, and was introduced into England about 1850. The zither consists of a resonance box, with a large circular sound hole near the middle; the strings, 32 in number, in some cases increased to 40 and even 46, being made of steel, brass, catgut, and silk covered with fine silver or copper wire, and tuned by pegs at one end. Five of the strings are stretched over a fretted keyboard, and are used to play the melody, the fingers of the left hand stopping the strings on the frets, the right-hand thumb, armed with a metal ring, striking the strings, which are tuned in fifths, and have a chromatic range from C in the second space of the bass staff to D in the sixth ledger line above the treble. The remainder, called the accompaniment strings, are struck by the first three fingers of the right hand. The viola zither, in which the resonance box is heart-shaped, is tuned like the violin, and is played with a bow.

Zittau, tsit'tow, Germany, a town of Saxony, on the Mandau, near the Austrian frontier, 49 miles by rail east-southeast of Dresden. The chief public buildings are a splendid town-house, the churches of Saint Peter and Saint Paul, Saint John, and Mary, hospitals, custom-house, gymnasium, a municipal museum, and a valuable library. Its principal manufactures are cotton-spinning, dress goods, iron-founding, machinery, stained glass, cycles, ropes, paper, brewing, and brick-making; and there is a trade in cotton and linen goods, chemicals, etc. There are a number of lignite mines in the neighborhood.

Zittel, tsit'til, Karl Alfred von, German paleontologist and geologist: b. Bahlingen, Baden, 25 Sept. 1839; d. Munich, Bavaria, 6 Jan. 1904. After study at Heidelberg and Paris, he entered the geological survey at Vienna, in 1863 a lecturer in the university there, and in the same year professor of mineralogy at Karlsruhe. In 1866 he was made professor of paleontology and geology at Munich; and in 1899 president of the Bavarian Academy of Sciences and curator-general of the scientific collections of Bavaria. The Rohlf's expedition to Egypt and the Libyan desert in 1873-4 derived much of its value from his important labors. Among

his publications are the 'Paläontologische Studien über die Grenzschichten der Jura- und Kreideformation' (1868-83); 'Aus der Urzeit' (1872; 2d ed. 1875); 'Handbuch der Paläontologie' (with Schimper and Schenk 1876-93), the most complete and authoritative work in that field; and 'Geschichte der Geologie und Paläontologie bis Ende des neunzehnten Jahrhunderts' (1899). He edited the periodical 'Paläontographica.'

Ziwet, Alexander, American mathematician: b. Breslau, Germany, 8 Feb. 1853. Graduated from the Polytechnical School of Karlsruhe in 1880, he came in that year to the United States, and for some time was connected with the United States lake survey (Detroit) and the coast and geodetic survey (Washington). Subsequently he became successively instructor in, and junior professor of, mathematics in the University of Michigan. In 1892 he was made co-editor of the 'Bulletin' of the American Mathematical Society. He published an 'Elementary Treatise on Theoretical Mechanics' in three parts, as follows: Pt. I., 'Kinematics' (1893); Pt. II., 'Introduction to Dynamics, Statics' (1893); Pt. III., 'Kinetics' (1894).

Zizania, a genus of grasses (q.v.) including the wild rice.

Zizyphus, a genus of *Rhamnaceae*, shrubs or small trees, with spiny stipules, alternate three-nerved leaves, a spreading five-cleft calyx, five hood-like petals, five stamens, a five-angled disk, adhering to the tube of the calyx, and having enclosed within it the two-or three-celled ovary. Fruit a drupe, which is sometimes edible and has a large stone or kernel containing from one to several flattened seeds. *Zizyphus* is widely distributed, but is chiefly indigenous to tropical Asia and America. The fruits of the cultivated *Z. jujuba*, and of *Z. sativa*, are of the size and shape of a small, oval plum. They ripen in September when they are gathered and stored in a dry place, the pulp becoming sweeter by the process. They have a dark-red skin, but are yellow within. If carefully dried, these fruits, called jujubes, will keep for a long time, and retain their acid flavor, which has made them a refreshing dessert fruit, in the Mediterranean countries and in China. They are nutritive and demulcent, a cough medicine having been prepared from them, and formerly, the sweet-meat known as jujube paste, was made from the evaporated juice of jujube, and of gum-arabic; but now the jujube is displaced by the gum and by gelatine. *Z. sativa* is a handsome arborescent shrub, with small, varnished, oval leaves and greenish inconspicuous flowers, succeeded by the bright drupes. It is sometimes cultivated in the United States, being hardy as far north as Washington. The bark, in its native countries, was used medicinally, for fever and for sores; and it is also employed for tanning and for a dye-stuff like that of *Z. xylopyra* which yields a black dye. Various parts of other species yield medicines, and the edible fruits of *Z. baeli* of Africa are used for a pleasant drink and are also made into bread. *Z. lotus* is by some believed to be the lotus-trees the fruit of which produced such indolence in those who ate them. It grows in Barbary, where it is called sadr. *Z. spina-*

ZLATOUST—ZOAR

christi is a small, prickly tree, which is reputed to have composed Christ's crown of thorns. Like other spiny species of *Zurphus*, this is a good hedge plant. *Z. nummularia* of Persia and India is one of the camel's thorns, whose foliage forms a fodder, and which has edible fruits. The cog-wood of Jamaica, an important timber tree, is *Z. chloroxylon*.

Zlatoust, zlá-tó-oost', Russia, a town in the province of Ufa, on the Ai, an affluent of the Ufa, near the Ural Mountains, 150 miles northeast of Ufa. In the vicinity are rich iron and gold mines, and in the town are government works, manufacturing sword-blades, steel instruments, and ammunition. Pop. about 22,000.

Znoim, tsnim, Austria, a town of Moravia, on the Thaya, 50 miles northwest of Vienna. The chief buildings are a Rathaus (1446), a circular church, said to have been a heathen temple, and the Gothic church of Saint Nicholas. The old ducal castle crowns a neighboring height. The trade is largely agricultural. Mustard, wine, and cucumbers are exported. Fine majolica, leather, and chocolate are manufactured. New waterworks were opened in 1877. As Znoimo, it was the capital of Moravia, destroyed in 1145 by the Bohemian Prince Vladislav, and rebuilt in 1226. On 11 July 1809, the French under Massena and Marmont defeated the Austrians here, and in 1866 it was captured by the Prussians.

Zoar, zó'ar, Separatist Society of. The Separatist Society of Zoar was a communistic religious organization located at Zoar, on the Tuscarawas River, Tuscarawas County, Ohio. They were German Protestant peasants, 225 in number, who emigrated from Würtemberg in April 1817. Their chosen leader was Joseph Baumler, whose name was later changed, for the sake of euphony, to Bimeler. Bimeler was of humble origin, but a man of unusual ability and independence, well educated, a natural leader, and a fluent speaker; he purchased in his own name, in the locality named above, 5,000 acres of farm land, at an average value of \$3 per acre, giving a mortgage at long time for the entire amount. This Separatist emigration had been primarily, for the purpose of securing religious liberty; and, for better opportunities in obtaining a livelihood. It was expected that each family would, by its industrious labor, secure separate ownership in a portion of the land held by Bimeler, but the colonists being diverse in age, strength, experience, education, and enterprise, they soon realized that their personal inequality stood in the way of the collective success of the colony, and early in 1819 they decided to organize into a community of property and effort. Articles of agreement were signed by 159 adults—53 males and 104 females. The articles created a community of interest, present and prospective, whereby all the property, movable and immovable, of the individual members, and their future earnings should become the common stock of the association, to be held and managed by chosen directors. Death of a member passed no property interest to his heirs, and withdrawal from the society, voluntary or compulsory, carried with it no claim upon a divided or undivided right in the association. Bimeler was to retain the realty in trust

until the society by its earnings could pay the mortgage and assume title.

In 1832 the society was incorporated under the then existing laws of Ohio by the name of "The Society of Separatists of Zoar." This conferred upon the society the ordinary powers of a corporation, with perpetual succession, power to hold property, purchase and sell, pass by-laws, etc. Under this reorganization the members were divided into two classes, known as the novitiates and the full associates; the novitiates were obliged to serve at least one year before admission to the second class, and this applied to the children of the members if, on becoming of age, they wished to join the society; the full associates must be of legal age—the males 21 and the females 18; all officers were elected by the whole society, the women voting as well as the men, all elections being by ballot and a majority vote; the government of the community vested solely in a board of three trustees (or directors) to serve three years each, one to be elected annually; these trustees had unlimited power over the custody and management of the property and all the temporalities of the society, but were bound to provide clothing, board and dwelling for each member "without respect to person," and use all means confided to their charge for the best interests of the society; they directed the industries and detail of affairs of the society; assigned each member his especial work, and the portion of necessities each should receive. Beside the board of trustees there was a standing committee, or council, of five, one member being elected each year. This council was the supreme judiciary, or board of arbitration, of the society, in cases of disagreement, dissension, or complaint; it had power to excommunicate members or deprive them of participation in the affairs of the society. They also elected once in four years a cashier or treasurer who had custody of all moneys, kept the books, and had immediate oversight over the finances of the society. In addition there was an official known as the "agent general," who acted as the trader to buy and sell for the society in its dealings with the outside world, make and enforce contracts, etc. The office of agent general was regarded as the position of honor and influence, and to it Joseph Bimeler was elected for life; after his death the office remained vacant, its duties being performed by the cashier or the trustees.

The society, from its organization as a commune, steadily prospered, and in time built up a large number of enterprising and successful industries, having in the period of its height two large flour mills, saw mill, planing mill, machine shop, tannery, dye house, stove foundry, cooper shop, woolen mill, brewery, slaughter house, blacksmith shop, tile works, pottery, etc. In all these concerns a high grade of goods was produced, which found a ready market with foreign customers. The value of the Zoar property increased until about 1875, when their land, industrial plants, and money accumulation were estimated at \$1,500,000. From that time the enterprise began to decline. Bimeler died in 1853, and there was no leader or director his equal in sagacity or personality. The environment of the society slowly changed from that of a western pioneer frontier to a prosperous, cultivated section of country, and rival neighboring in-

dustries made inroads into the export business of Zoar; the Zoarites were not progressive and did not keep pace in their manufactures with modern methods and improvements, and in time found that they could purchase products for use and wear cheaper than they could make them; there were few accessions to the society; the original members became too old and feeble to conduct its affairs; outside laborers had to be employed; the younger members were inclined to leave and seek their fortunes where they could acquire independent property and freedom of action. This decline continued until in 1897, when, by a common consent, the organization decided to disband and place the property in the hands of a commission for equal division. The appraisal and distribution was completed in the fall of 1898. There were at this time 222 people, adults and children, in the society, of whom 136 were entitled to one equal share. They each received a few hundred dollars in cash and a portion of the farm land or village property.

The religious tenets of the Zoarites were few and simple. They confessed the doctrine of the Trinity; the fall of man; the return through Christ; the Holy Scriptures as the guide of their lives; all ceremonies were declared useless and injurious; marriages were contracted by mutual consent and before witnesses; they recognized no ordained minister, and engaged in no public prayer. Bimeler was their only preacher and teacher; he spoke each Sunday to the society, and after his death his published discourses were read in the public meetings by various members. The society did not seek additions and made no attempt to propagate its principles, either economic or religious. The life of the Zoarites was one of utmost simplicity, serenity and morality. There never was a divorce in the community and no member was ever charged with a crime or felony. Consult: Randall, 'History Zoar Society,' and Nordhoff, 'Communitistic Societies in U. S.'

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Secretary of the Ohio State Archaeological and
Historical Society.

Zöckler, tsék'ler, Otto, German Lutheran theologian; b. Grünberg, Hesse, 27 May 1833. He was educated in the universities of Giessen, Erlangen, and Berlin, became a lecturer at the first-named in 1857, and in 1863 professor of theology. In 1866 he was appointed professor at Greifswald, and in 1885 consistorial councillor. He is one of the leaders of the movement toward the establishment of a state church in Prussia. In 1882 he became editor of the 'Evangelische Kirchenzeitung.' Among his works are: 'Hieronymus, sein Leben und Wirken' (1865); commentaries to Chronicles, Job, Proverbs, Ecclesiastes, Canticles, and Daniel, in Lange's 'Bibelwerk' (1866-72; Eng. trans. 1870 et seq.); 'Das Kreuz Christi' (1875; Eng. trans. 1877); 'Gottes Zeugen im Reich der Natur' (1881; Eng. trans. 1886); and 'Biblische und Kirchenhistorische Studien' (1893). For the 'Kurzgefasstes Kommentar zum Alten und Neuen Testament und zu den Apokryphen' (1886 et seq.), which he edited with Strack, he prepared the commentaries on the Old Testament apocryphal books, the Acts, and the epistles to the Thessalonians and Galatians.

Zo'diac. The zodiac is a belt of the celestial sphere, extending 8° on each side of the ecliptic, or the path of the sun among the stars. "The name is derived from *zōon*, a living creature, because the constellations in it (except Libra), are all figures of animals. It was taken of that particular width by the ancients simply because the moon and the then known planets never go farther than 8° from the ecliptic" (Young's 'Astronomy'). The belt is divided into 12 parts, of 30° each, to which are given the following names: Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces. This division into 12 parts was suggested by the 12 re-appearances of the moon in a year. The idea seems to have originated with the Chaldean astronomers.

Owing to the fact that the earth is not a perfect sphere, the pole of the earth's equator describes a circle around the pole of the ecliptic, which causes a constant retrograde motion in equator with the point of intersection of the plane of the zodiac. The rate of this motion is 1° in 70 years, and has amounted to 30°, or one entire sign, up to the present time. "The sign of Aries, therefore, is now in the position of the constellation Pisces; each sign having backed so to speak into the constellation west of it." The constellations themselves bear no resemblance to the signs designated by them.

During the Middle Ages the signs of the zodiac were supposed to influence human life, and hence were distributed to different parts of the human body. Disease was supposed to be cured by the aid of the zodiacal power presiding over that part of the body. The remnant of this superstition is still seen in some almanacs.

The Egyptians are supposed to have adopted the 12-fold division of the Zodiac from the Greeks, but they changed the symbols of living creatures to others of their own. The Chinese divided the course of the sun into 12 parts, which they designated as the Rat, the Ox, the Tiger, Hare, Dragon, Serpent, Horse, Sheep, Monkey, Hen, Dog, and Pig. This division is still found in some parts of Central Asia, and Japan. It has also been found among the remains of the Aztec race in America. The original zodiacal constellations occupied unequal spaces in the heavens. Hipparchus was the first to divide the zodiac into equal spaces of 30° each, and give to them the names of the older constellations. His method of reckoning positions in the ecliptic was used until this century. Astronomers have now abandoned it for the more accurate measurement of degrees, beginning at the vernal equinox.

The origin of the names of the animals assigned to the zodiac by the ancients is unknown. Some have supposed that the spring signs: Aries, the Ram, Taurus, the Bull, and Gemini, the Twins, mark the time of the bringing forth of young by flocks and herds. Cancer, the Crab, marks the time when the sun appears to move backward. Leo, the Lion, symbolizes the fierce heat of summer, and Virgo, the Virgin, gleaming corn, symbolizes the harvest. In Libra, the Balance, the day and night balance each other. Scorpius is supposed to have marked the presence of venomous reptiles in October; while Sagittarius symbolizes the season of hunting.

ZODIACAL LIGHT—ZOHAR

Capricornus marks the beginning of the return of the sun to the north, Aquarius symbolizes the winter rains, and Pisces the season of fishes. These are but fanciful representations, and have no foundation in fact.

Zodiacal Light. "The zodiacal light is a faint column of light rising from the western horizon after twilight in winter or spring evenings; and before daybreak in summer or autumn. It extends out on each side of the sun, and lies nearly in the plane of the ecliptic. Near the equator it can be seen all the year, and has been traced all the way across the heavens from east to west, forming a complete ring." In our latitudes it can seldom be traced more than 90° from the sun. Parts of the column near the sun are somewhat bright, but distant portions are extremely faint, and can only be seen on the very clearest nights. The cause of the zodiacal light is not definitely known. The theory most generally received is that it is sunlight reflected by myriads of small meteoric bodies revolving around the sun, nearly in the plane of the ecliptic. This theory would require a thin flat ring of these meteors to extend beyond the orbit of the earth. The theory is not established. The name zodiacal light was given to this phenomenon by Cassini in 1653, who described it as a flat luminous ring encircling the sun nearly in the plane of the ecliptic. Kepler supposed it to be the atmosphere of the sun; but Laplace showed that the atmosphere of the sun could not extend to anything like the distance from the sun which is reached by the zodiacal light. In 1853 an extended series of observations was made by Jones from different parts of the Pacific ocean. From these observations he deduced the theory that the zodiacal light was caused by a ring of matter surrounding the earth, and not the sun.

Professor Wright, of Yale University, has determined that the spectrum of the light is continuous, and therefore is essentially reflected sunlight. He has also determined that the light is partially polarized in a plane passing through the sun, and that the amount of the polarization is between 15 and 20 per cent. The origin of the minute particles which reflect the light has been accounted for in many ways. By some they are believed to have been thrown out from the corona of the sun; by others to be composed of dust thrown out from the equatorial regions of the sun; but by most they are believed to be an immense cloud of meteoroids filling the space between the earth and the sun. The meteoric theory of the sun's heat presupposes a multitude of these meteoric bodies constantly falling into the sun to supply the loss by radiation, as well as multitudes of others which never reach the surface. It is not probable, however, that these meteors if they exist play any part in the phenomena of the zodiacal light.

Zōē, zō'ē (Gr. Ζωή), empress of the East: b. about 978; d. 1050. She was the daughter of Constantine IX., and became the wife of Romanus III. in 1028. She became the murderess of her husband, in order to place Michael IV. on the throne. The latter dying, was succeeded by his nephew, Michael V., who was deposed by the people. Zōē and her sister Theodora were then proclaimed joint sovereigns. She displayed

great ability and firmness in the government, and in 1042 married Constantine IX., Monomachus. She reigned till her death.

Zo'trope, a modern mechanical toy, depending, for its interest on the constancy of visual impressions. It consists of a rotating drum, open at the top, in which around its inner periphery are placed strips of paper, having figures of men, animals, etc., in varying positions. By turning the cylinder the images are seen through slots in its upper side, giving the effect of action to the figures.

Zoffany, tsōf'fā-nī (properly Zaufelby), Johann, German painter: b. Ratisbon 1733; d. London 11 Nov. 1810. He was a pupil of Speer at Ratisbon, studied also for 12 years in Italy, in 1758 went to England, there first attracted attention by a portrait of Garrick, and soon won considerable reputation. He was sent by George III. to Italy, where he executed 'The Tribune of Florence,' one of his most celebrated works. In 1783 he went to India, where he was very successful in his art. Among his further paintings are: 'Earl of Barrymore'; 'Foote'; 'Weston'; 'Members of the Royal Academy'; 'Tiger Hunt'; and 'Embassy of Hyder Beg.'

Zogbaum, Rufus Fairchild, American artist: b. Charleston, S. C., 28 Aug. 1869. He studied at the Art Students' League (1878-9) and in Paris with Léon Bonnat (1880-2), made extensive study of European armies in field and garrison, and later became known as a leading delineator of military and naval subjects, which he renders with scrupulous fidelity to the various points of detail. His publications, written and illustrated by himself, are: 'Horse, Foot, and Dragoons' (1887); 'All Hands'; and 'Ships and Sailors.'

Zohar, zō'hār, the Bible of the Kabbalists, long revered by Jewish mystics and regarded by some as higher than the Bible and the Talmud, has, however, been proved a clever forgery. The secret science of the Kabbala received a marked development at the beginning of the 13th century, when a mystic, Ezra or Azriel, compiled a work called 'Brilliance' ('Bahir') (1240). In an atmosphere of reputed miracles and a new Messiah, there appeared some years later the most famous Kabbalistic book of the time—the 'Zohar,' or 'Splendor.' It was offered as the work of Simon ben Jochai, a sage of the 2d century, of whom many legends are told. He is said to have spent years in solitude, a hermit receiving special revelations. It was claimed that for over a thousand years the 'Zohar' had been concealed in a cave in Galilee and had been at last brought to light. The literary forger who "discovered" the 'Zohar' was Moses of Leon (born in Leon about 1250, died in Arevalo 1305), who employed an Aramaic idiom to give the book an air of antiquity, and with such skill that Jew and Christian alike were deceived and some even to-day attribute to it hoary age. Yet his widow admitted that it was a forgery.

The character of the 'Zohar' can hardly be dismissed as unique in literature, with its fantastic, imaginative, and emotional elements. It is a medley of spirituality and coarseness, a strange combination of intellectuality and grosse-

ness, whose influence has been far-reaching and whose adherents have numbered hundreds of thousands. It is a work without method, a kind of impressionist commentary on the Pentateuch, half homily, half meditation, dwelling largely on the "higher" sense of Scripture and allowing every opportunity for vague and mystic interpretation. Hence the moral perversions that abound, the blasphemy and absurdity. The pre-existence of the soul is assumed—paradise and hell are alike depicted, the varieties of sin described with painful minuteness, Messianic speculations indulged in, and views favorable to the dogma of the Trinity uttered, while communion with departed spirits, celestial hosts, and angels completes the farrago of nonsensical speculation. Such an aberration is rare in the history of Judaism and has been productive of much harm. Its soil has nourished gross superstitions and strengthened the belief in ghosts and evil spirits; its mode of interpretation has degraded the study of the Bible and spread the wildest fancies. At one time it was high in favor with the papacy when the Talmud was condemned to the flames, but it was later included in the Index Expurgatorius. Its occasional Christian tone was not overlooked by Christian scholars—Pico di Mirandola (1463-94) and Reuchlin (1455-1522) both made the 'Zohar' the basis of their vindication of Jewish literature. Its literary influence, however, was not long retained. It developed a few "saints" and "miracle workers," spurious Messiahs and the like, but it has had no successor. In absorbing the miasma of the earlier Kabbalistic literature, it left no germs for further development. See **Jews and Judaism**.

Bibliography—Graetz's 'History of the Jews,' Vols. III. and IV.; Abrahams' 'Jewish Literature,' pp. 172-5.

Zölma, zôl-lâs (Gr. *Zôlma*), Thracian rhetorician, chiefly remembered for the asperity of his criticisms on the poems of Homer. An account of his career is given by Vitruvius, which is not self-consistent, and the time at which he lived is uncertain. He is said to have been a pupil of Polycrates, to have been eminent before the rise of Socrates, and to have continued to write until the reign of Alexander. Vitruvius represents him as seeking the patronage of Ptolemy Philadelphus. Heracleides says he was originally a Thracian slave. He is reported to have died a violent death. The violence of his attacks on Homer procured him the title of *Homeromastix*. He also attacked Plato and Isocrates. It is said he found fault with Homer principally for introducing fabulous and incredible stories into his poems. He has acquired the reputation of having been a captious and unjust critic, but Dionysius of Halicarnassus places him in the highest rank. Consult Spindler, 'De Zöllo' (1888-9).

Zoïlîte, a mineral closely related to epidote. It is a basic ortho-silicate of calcium and aluminum, $\text{HCa}_2\text{Al}_2\text{Si}_2\text{O}_{10}$. The aluminum is sometimes partly replaced by iron, the mineral thus approaching epidote in composition. Though its crystals are orthorhombic, their form is very similar to the monoclinic epidote. Its hardness is 6 to 6.5 and specific gravity about 3.3. Its color is usually dull gray or

brown, but in the variety 'thulite,' found in Norway, it is a beautiful rose pink. It is found in many European localities, also abundantly in the New England States, Pennsylvania, and North Carolina, and in exceptionally good crystals at Ducktown, Tenn.

Zola, zô'la, Fr. zô-lâ, Emile, French novelist; b. Paris 2 April 1840; d. there 29 Sept. 1902. He was educated at the Collège of Aix, from which he went to the Lycée St. Louis at Paris with a scholarship in 1858. His career there was undistinguished, and he left in 1860 after failing to take his degree owing to insufficiency in literature. After a very brief experience as a clerk in a business house he was for more than a year compelled to sound the lowest depths of poverty in Paris, but in 1861 he obtained employment as a shopman with MM. Hachette, the publishers, at a salary of a pound a week. He devoted his spare time to literary work, contributing short stories to the 'Petit Journal' and 'La Vie Parisienne,' and critical articles to the 'Salut Public' of Lyons and afterwards to Villermessant's journals, the 'Evénement' and the 'Figaro.' Several of his stories were published separately in the volumes 'Contes à Ninon' (1864), which contains some of his best and purest work, and which was followed in 1874 by 'Nouveaux Contes à Ninon.' Some of his critical articles were collected under the title 'Mes Haines' (1866). In 'La Confession de Claude' (1865), a novel in which he utilized his early struggles, we find him already in full progress toward the characteristic work of his maturity, and this tendency became still more marked in the immediately succeeding novels: 'Le Vœu d'une Morte' (1866); 'Les Mystères de Marseille' (1867); 'Thérèse Raquin' (1867), a powerful study of the effects of remorse following on adultery and murder; and 'Madeleine Féral' (1868). Having by this time gained a secure footing in the world of letters, he conceived the plan of the series of novels known as 'Les Rougon-Macquart,' which includes his best-known work and occupied him for nearly a quarter of a century. It is described as an 'histoire naturelle et sociale d'une famille sous le second empire,' and consists of 20 works dealing with different phases of modern life, not always strictly that of the Second Empire, but rather that of the Third Republic. The particular departments of life treated in the volumes were studied by Zola in the spirit of a scientific observer, but of one with a decided bias toward the portrayal of moral filth and disease; and the bond of connection which constitutes them a series is the persistence under various forms in all the members of the Rougon family of a moral taint which is transmitted in accordance with Zola's views of heredity. The series consists of the following works: 'La Fortune des Rougon' (1871); 'La Curée' (1874); 'La Conquête de Plassans' (1874); 'Le Ventre de Paris' (1875), treating of the Paris markets; 'La Faute de l'Abbé Mouret' (1875), whose subject is clerical celibacy; 'Son Excellence Eugène Rougon' (1876); 'L'Assommoir' (1877), a powerful but revolting study of the effects of drunkenness and idleness, the first great success of the series; 'Nana' (1880), a coarse picture of courtesan life; 'Pot-Bouille' (1882);

'*An Bonheur des Dames*' (1883), dealing with the great shops of Paris; '*La Joie de Vivre*' (1883); '*Germinal*' (1885), treating of the life of French miners; '*L'Œuvre*' (1886), in which he dissects literary and artistic decadents; '*La Terre*' (1888), a study of the French peasantry in which purulent naturalism reaches the zenith of repulsiveness; '*Le Rêve*' (1888); '*La Bête Humaine*' (1890), treating of railways; '*L'Argent*' (1891), dealing with stockbrokers and company promoters; '*La Débâcle*' (1892), a powerfully realistic picture of military life in connection with the Franco-German war and the break-up of the Second Empire; and '*Le Docteur Pascal*' (1893), in which the whole is brought to a conclusion. Immediately after completing this huge undertaking he started the '*Trois Villes*' series, consisting of '*Lourdes*' (1894), '*Rome*' (1896), and '*Paris*' (1897), in which he portrays the spiritual development of a priest, Pierre Froment, out of miraculous Christianity through a sort of social Catholicism into a creed of justice and labor. In the incomplete tetralogy entitled '*Les Quatre Évangiles*' ('*The Four Gospels*') he proposed to formulate his social gospel. The first volume is '*Fécondité*' (1900), whose hero, Mathieu, is the son of the hero of the preceding series. The second volume, '*Travail*' ('*Labor*,' 1901), has a hero named Luc; and of the remaining two, '*Vérité*' (Truth) and '*Justice*,' whose heroes were to be named after the other two evangelists, the former was appearing at the time of his death. In the eyes of English readers Zola appears best in his short stories, of which, in addition to those already mentioned, collections entitled '*Le Capitaine Corle*' (1882), and '*Nais Micoulin*' (1883) have been published. His famous story of '*L'Attaque du Moulin*' forms part of the volume of '*Soirées de Médan*' (1880), to which Maupassant and other friends also contributed. He defended his view of the nature and function of literary art and collected many critical articles in several works. Several of his novels were dramatized by himself and others, and he also wrote for the stage '*Les Héritiers Rabourdin*' (1874), and '*Le Bouton de Rose*' (1878), but none of them except '*L'Assommoir*' (1881), known in Charles Reade's English version as '*Drink*' (1879), were at all successful. Zola's chivalrous defense of Captain Dreyfus (q.v.) in 1898 led to his trial and condemnation to imprisonment and fine. He was created a knight of the Legion of Honor in 1888 and an officer in 1893, but after his condemnation in 1898 his name was removed from the roll. He was president of the Société des Gens de Lettres in 1891-4, but he was repeatedly refused admission to the Academy. Zola was the recognized head of the naturalistic school in fiction, but his followers were latterly few in number. His novels belong rather to the domain of science than to that of art. They are studies, in the main faithful enough though not free from distortion and exaggeration, in moral and social pathology; but they are not true to life and nature in the fullest sense, in the only sense which would entitle them to rank as artistic creations. Translations of the most important have appeared, chiefly by Visetelly. Consult Brunetière, '*Le Roman Naturaliste*' (1883), and R. H. Sherard's highly

eclogistic biographical and critical study (1893).

Zollars, Ely Vaughan, American educator: b. near Lower Salem, Washington County, Ohio, 17 Sept. 1847. Graduated from Bethany College (W. Va.) in 1875, he was pastor of the church of the Disciples of Christ at Springfield, Ill., in 1885-8, and in 1888-1902 was president of Hiram College (Ohio). His writings include '*Holy Book and Sacred Day*' (1893); '*Bible Geography*' (1894); '*Great Salvation*' (1895); and '*Hebrew Prophecy*.'

Zollicoffer, zöll-kóf-er, Felix Kirk, American soldier: b. Maury County, Tenn., 19 May 1812; d. near Mill Springs, Ky., 19 Jan. 1862. He entered the printer's trade, published a weekly newspaper at Paris, Tenn., for about a year, and finally became editor of the '*Observer*' at Columbia, Tenn., his duties being temporarily interrupted by his service in the Seminole war, in which he rose to be a commissioned officer. At Columbia he also published and edited an agricultural weekly. He became editor of the Nashville '*Banner*,' the leading Whig organ of Tennessee, in 1841; in 1844-9 was State comptroller; and in 1853-9 was a representative in Congress. In 1861 he entered the Confederate army with brigadier's rank. He was in immediate command at the battle of Mill Springs, on the Cumberland, when Thomas drove the Confederates from the field, and achieved the first real victory for the National cause. Zollicoffer was killed within the enemy's lines, whither he had passed by mistake while on a tour of reconnaissance.

Zolling, tsöll'ing, Theophil, German editor and author: b. Scafati, near Naples, Italy, 30 Dec. 1849; d. Berlin 23 March 1901. He was educated at Vienna, Heidelberg, and Berlin, and from 1881 was editor of the Berlin weekly, '*Die Gegenwart*.' Unsuccessful with his dramas, he wrote some works of fiction that were well received,—among them '*Der Klatsch*' (1889); '*Couliassegeister*' (1891), and '*Bismarcks Nachfolger*' (1894). For Kürschner's '*Deutsche Nationalliteratur*' he prepared a four-volume critical edition of the works of Heinrich von Kleist (q.v.).

Zöllner, tsöll'nér, Karl Friedrich, German physicist and astronomer: b. Berlin 8 Nov. 1834; d. Leipsic 25 April 1882. Educated at Berlin and Basel, he became a lecturer in the University of Leipsic in 1865, in 1866 professor extraordinary of physical astronomy, and in 1872 professor ordinary. He made numerous contributions to astronomical science. These included the determination of the reflective capacity (albedo) of many planets and a study of their thermal conditions; photometric investigations of the Mercurian phases; and a study, through observation, of the intensity of solar radiations at their source, of the solar temperature. His '*Grundzüge einer allgemeinen Photometrie des Himmels*' (1861) contained the description of a new instrument, the astrophotometer, for the measurement of the light and color of stars. To the publications of the Royal Saxon Scientific Society he furnished many papers on the physical constitution of the sun and stars; and he constructed spectroscopic instruments. '*Ueber die Natur der Kometen*' (1872; 3d ed. 1883) expounded the theory that

the brightness of comets is due not to the fact that they are incandescent through heat but that they are glowing with electricity. Zollner was latterly interested in spiritualism. Among his further volumes are 'Photometrische Untersuchungen' (1865), and 'Ueber die universelle Bedeutung der mechanischen Principien' (1867). Consult the study by Körber (1899), and Clerke, 'Popular History of Astronomy in the 19th Century' (1893).

Zollverein, tsöl'fër-lîn ("customs-union"). The feeble German Confederation formed in 1815 failed in many respects to meet the desire for union among the German people, or even to satisfy their practical requirements. The trade of Germany in particular suffered much from the obstructions caused by the different customs systems of so many petty states. In 1818 Prussia took the initiative of abolishing internal customs, but this policy excited much opposition among the other German states, and even on the part of the Bund itself, which was indeed to some extent justified by the coercive measures used by Prussia to enforce the adoption of its policy on the smaller German states within its bounds. Prussia offered to admit the other German states within its union, but many of them preferred to set up rival and antagonistic associations. Thus Bavaria and Würtemberg formed a customs league in 1827, and Hohenzollern joined these states in 1828. In the same year was formed the Middle German Union, including Saxony, Hanover, Hesse, Brunswick, Nassau, Oldenburg, Bremen, Frankfurt-on-the-Main, etc., and in 1834 another union (Steuerverein) between Hanover, Brunswick, Schaumburg-Lippe, and which was joined by Oldenburg in 1836. But these hostile unions were not sufficiently extensive to have any great vitality, and they were gradually disintegrated by the desertion of their individual members to join the Prussian union. Electoral Hesse joined in 1831; Bavaria, Würtemberg, Saxony, and other states in 1833; Hesse-Homburg, Baden, and Nassau in 1835; Frankfurt in 1836; Luxemburg in 1842; Hanover, Oldenburg, etc., in 1851. During the treaty period of 1854-63 nearly all Germany, with the exception of Austria, the two Mecklenburgs, and the Hanse-towns, was included in the union. A difference of views between the various parties to the union began at this time to develop, which caused much tedious negotiation. In general the north of Germany was in favor of imposing import duties on foreign trade for purposes of revenue only, while the south favored protective duties. As each member of the Zollverein had an equal voice in the direction of a common policy it was impossible to adjust these differences so as to satisfy the more powerful states, particularly Prussia. Austria also wished either to be included in the union or to break it up. Matters continued substantially in the same state after the renewal of the treaty from 1 Jan. 1866 to 31 Dec. 1867; but the war of 1866 put an end to this agreement, and new arrangements were entered into according to the political combinations then formed, Prussia obtaining a preponderating influence in the union of 1867, which included the North German Bund, Bavaria, Würtemberg, Baden, Hesse (south of the Main), and Luxemburg. It was directed by a

Zollbundesrath and a Zoll parliament. The total number of votes in the Zollbundesrath was 58, of which Prussia had 17. This arrangement, formed for 12 years, was also brought to an end prematurely by the formation of the German Empire. By article 33 of the constitution of the empire the territory included in the Zollverein is to coincide with the territories of the empire, with a few exceptions noticed below. The powers of the Zollbundesrath and Zoll parliament are transferred to the legislative bodies of the empire, and the affairs of the central bureau of the Zollverein are transferred to committees formed by the Federal Council of the empire. The territories of the free ports of Hamburg and Bremen were for some time excluded from the Zollverein, and some communes of the grand duchy of Baden and a fragment of Hamburg are still excluded from it; while Luxemburg and the Austrian commune of Jungholz are included in it. See GERMANY.

Zol'nay, George Julian, American sculptor: b. Hungary 4 July 1863. He was for a time in the civil service, but subsequently studied at the Imperial Academy of Fine Arts, and in 1890 came to America, where he was connected with the staff of sculptors of the World's Columbian Exposition. His work at the Nashville, Tenn., exposition of 1897 attracted considerable attention. Among important examples of his art are a tympanum for the University of Virginia, a bust of E. A. Poe for the same, a statue of Jefferson Davis at Richmond, Va., and numerous portrait busts.

Zom'ba, capital of the British Central Africa Protectorate, situated in Nyassaland, on the southern slope of Mount Zoba, 10 miles west of Lake Shirwa, at the height of about 3,000 feet above the sea. Zomba is in telegraphic communication with the principal stations in Central Africa and Cape Town. A sanatorium has been built on a plateau 2,500 feet higher up. The population is as yet small.

Zombor, zóm'bör, or **Sombor**, Hungary, a town of the comitat of Bács-Bodrog, on the Baczor or Franzens Canal, which unites the Theiss with the Danube, 65 miles southwest of Szegedin. It has two Greek churches, a magnificent town-house, and a public library, and carries on manufactures of silk. There is a large trade in cattle and corn. Pop. about 31,000.

Zona Libre, sô'nâ lê'brâ, a strip of country extending along the whole northern frontier of Mexico, 20 kilometres wide, where imported goods are admitted at 10 per cent of the ordinary duties for use within the zone. This zone was first established on the frontier of the state of Tamaulipas alone, in 1858, and was not extended across the whole frontier until 1885. At one time after the Civil War, the United States authorities claimed that the privileges permitted within the zone encouraged smuggling; the Mexican government claims that the conditions of retail trade make the zone a necessity; opposition to the zone, however, exists among competing manufacturers in the interior of Mexico.

Zon'aras, Joannes, Byzantine historian of the first half of the 12th century A.D. He filled some distinguished offices about the imperial court, but gave himself up to a religious life as

ZONE—ZOOGEOGRAPHY

a monk of Saint Basil, employing his leisure hours in the compilation of a 'History of the World from the Earliest Periods to the Year 1118.' In this work (of which an edition appeared at Paris in 1686) he follows principally the narrative of Dio Cassius, of whose first 20 books nothing is extant save Zonaras' abstract; but as he approaches his own times he becomes more entitled to attention, as his mistakes arise evidently more from ignorance than design. There is also extant a commentary on the apostolic canons by him. There is an edition of the 'History' by Pinder (1841-4), with a third volume by Büttner-Wobst (1897).

Zone, the term applied to any portion of the earth's surface bounded by two parallels of latitude, but more particularly applied to five such zones, the position of which is marked by natural boundaries. These five zones are called the torrid, northern and southern temperate, and northern and southern frigid zones. The torrid zone extends $23\frac{1}{2}^{\circ}$ north and south of the equator; and twice a year the sun shines vertically on its inhabitants. This zone is bounded, on both sides of the equator, by the two tropics; that is, the circles in which the sun reaches its greatest distance from the equator. As the rays of the sun here are nearly vertical a perpetual summer reigns, and day and night under the equator are always equal; and even at the tropics the difference is scarcely an hour. Owing to the nature and situation, however, of the countries in this zone the heat is not everywhere the same. The warmest portions are the sandy deserts of Africa, in the regions nearer the equator where vegetation prevails the heat is less excessive, in the islands of the South Seas a milder climate prevails, and the highest mountains of Peru and equatorial Africa are covered with perpetual snow. The two temperate zones extend from the tropics to the polar circles. They contain the most populous countries, and the climate is various. As the distance from the tropics increases the heat under similar conditions diminishes, the difference of the seasons becomes greater, the days and nights become more unequal until we arrive at a point where once a year the sun does not appear above the horizon during the 24 hours, and once a year does not set for the same time. The circles passing through these points, parallel to the equator and the tropics, form the limits of the temperate zones, and are called the arctic and antarctic circles. The distance from the tropics to the polar circles, or the breadth of the temperate zones, both in the northern and southern hemispheres, is 43° . All beyond the polar circles to the poles is called the frigid zones. The distance from the polar circles to the poles is $23\frac{1}{2}^{\circ}$. The characteristic of the frigid zones is, that day and night are more and more unequal the nearer you approach the poles; and for days, weeks, and even months the sun is either constantly above or constantly below the horizon. At the poles the year consists of one day and one night each six months long.

Zoogeography, the science of mapping out the surface of the earth with reference to its faunas; the study of the distribution of animal life. It has always been obvious to travelers, and even the most superficial students of nature, that the various regions of the earth's surface were

characterized, among other differences, by local peculiarities in animals and plants. It is a commonplace of knowledge that the animal life of the tropics is different from that of the Arctic regions; that the birds and mammals and small creatures of Africa differ almost altogether from those of South America or Australia. Closer examination shows that such differences exist in a greater or less degree between lesser regions, as the east and west sides of a continent, groups of islands separated by a sea-space, and so forth. On the other hand, there may be found striking resemblances in the faunas of certain separate regions, or a sameness over an extensive area, as Europe and Asia.

The importance and significance of these facts impressed themselves upon scientific men only within recent times. As long as it was held that each species must have been created, as a general rule within the geographical area which it now occupies, the most curious facts of distribution could be regarded only with "sterile wonder." But when the idea came to be entertained that allied species have had a common origin, it was obviously implied that they or their ancestors must have had a common birth-place; and consequently, when we find members of a group severed from their nearest kindred, we feel bound to inquire how this came about. Thus, we have to explain how the tapirs are confined to the Malayan region and South America; the camels to the deserts of Asia and the Andes; marsupials to the Australian region and America; how the birds, mammals and reptiles of North America resemble those of Europe more than those of South America, and so on.

Means of Dispersal.—Accepting as a starting point the proposition that the various forms of life originated in some parent-stock or stocks at a particular place or places, the present distribution of their descendants as we know them, must depend mainly upon the powers of dispersion which each possessed, and the character of the physical influences and obstructions which acted as controlling factors or barriers in guiding their dispersal along certain lines and altogether prevented it elsewhere. Theoretically a new stock would spread equally in all directions from its point of origin; actually a very irregular and complicated kind of distribution has ensued in most or all cases. Hence an inquiry as to the means and limitations of dispersion possessed by animals and plants is of first importance.

It is scarcely necessary to draw attention to the facilities for diffusion possessed by animals endowed with great locomotive powers, and especially, among land animals, by those having the power of flight (q.v.); but it is important to note that some animals, which in the adult state have only feeble powers of locomotion, are better endowed in this respect when young. Such, for example, is the case with echinoderms, marine mollusks, and similar lowly aquatic forms, all of which develop from free-swimming and often far-drifting larvæ. (See **PLANKTON**.) But accidental modes of dispersal must also be taken into account. The carrying power of winds is known to be sufficient to bear along in the air fine dust across seas many hundreds of miles in width; and we have in that agency alone an adequate means of accounting for the dispersion of all plants propagated by minute spores.

ZOOGEOGRAPHY

For that reason the distribution of most cryptogamic plants hardly enters into the problem, since these mosses, fungi, seaweeds, and the like are almost universal. What part winds may have played in carrying the seeds of flowering plants is more doubtful; but observations show that even for such seeds, especially when provided with some kind of feathery appendage, winds may occasionally serve as a means of transport for very long distances. See PLANT GEOGRAPHY; PLANT LORE.

But in the case of animals also, winds are a more important means of transport than one might at first suppose. Birds and insects are often blown immense distances out of their course; and to this cause, for instance, is due the arrival every year of American birds on the coasts of Great Britain and France, while European birds almost never reach America—a fact plainly due to the prevalent easterly direction of the winds, and especially the gales in spring and autumn,

Further, marine currents often carry on their surface various kinds of natural rafts, which may transport both plants and animals. In the polar regions icebergs and icefloes may serve this purpose; and elsewhere trunks of trees, and even fragments torn from the land. Such fragments, forming small islands with erect trees upon them, have been seen at a distance of 100 miles from the mouth of the Ganges and other rivers. Wallace points out that ocean waifs of one kind or another are almost the only means we can imagine by which land-shells can have acquired the wide distribution for which they are remarkable. Again, locomotive animals are very frequently the means of dispersing both plants and other animals. Seeds may be attached to the fleece or fur of mammals or the plumage of birds, or may be enclosed in clumps of earth clinging to the feet or some other part of bird or beast, even of insects. It seems probable that aquatic birds and water-beetles have been the means of distributing aquatic plants and fresh-

The Terrestrial Floral Domains according to Oscar Drude:			
1. Northern.	5. Central N. American.	9. Tropical American.	13. Andine.
2. Inner Asiatic.	6. Tropical African.	10. South African.	14. Antarctic.
3. Mediterranean.	7. East African Islands.	11. Australian.	
4. Eastern Asiatic.	8. Indian.	12. New Zealand.	

when birds are migrating. Insects have been caught on ships upward of 300 miles from land. Further, there are well authenticated cases of even crabs, frogs, and fishes being carried long distances by storms, and in this way it is possible to account for the transference of fish, etc., from one river system to another. Still more frequently, in all probability, are the eggs of such creatures transported by this means.

Next, marine currents also form, beyond doubt, a highly important means of dispersal both for plants and animals, and that in various ways. First, seeds may float on the surface of the ocean, and be carried by currents for hundreds of miles, and become stranded on a distant shore still in a condition fit for germination. The experiments of Darwin to determine the vitality of seeds in sea-water first enabled us to appreciate the importance of this factor.

water mollusks, which are remarkable for their wide diffusion: and the spawn of amphibians and fresh-water fishes may be conveyed from one body of fresh water to another by the same means.

Lastly, man is often unintentionally the means of conveying both plants and animals from one region to another. The foreign plants found growing on ballast heaps near every civilized port, are instances of this, and so, also, are the plants which have sprung from seeds introduced with imported grain and merchandise. The whole coastal region of North America is overrun with European weeds. Wherever European ships have gone the rats and other vermin of the Old World have accompanied them, and hundreds of species of exotic injurious insects are known in all agricultural districts.

ZOOGEOGRAPHY

Obstacles to Diffusion of Animals.—For all land plants and land animals, the most obvious and effective barrier is a wide expanse of ocean; and where the expanse is very wide it is seldom passable except with the aid of man. For land mammals the ocean is an absolutely impassable barrier, and hence native mammals are always absent from oceanic islands (that is, islands that have never been connected with the mainland); and this barrier is almost equally effective for serpents and amphibians, which also are nearly always wanting where there are no native mammals. Lizards are more frequently found indigenous on oceanic islands, though their means of transit from the mainland is unknown. Arms of the sea and broad rivers are likewise generally impassable for the creatures mentioned, though some of them have greater powers of swimming than is generally supposed. The jaguar, the bear, and the bison are capable of swimming the widest rivers; pigs have been known to swim ashore when carried out to sea to a distance of several miles; and even a boa constructor, it is said, has swum to the island of St. Vincent from the South American coast—a distance of 200 miles.

Mountains, and especially high mountains, are also frequently effective barriers to the migration of land plants and animals; but in some cases they enable plants and animals of a cold climate to spread into latitudes where, in the plains, the climate is too hot for them. Again, deserts act as a barrier to the majority of plants and animals; forests are a barrier to the camel, hare, zebra, giraffe, etc.; treeless regions to apes, lemurs, and many monkeys; plains to wild goats and sheep. Broad rivers also act occasionally as barriers to distribution, and that, strange to say, even in the case of some species of birds.

Another important barrier is that of climate; but climate merely limits the range of a species or group within a continuous area, for example, through limiting the food supply by restricting vegetation. The range of insects is peculiarly liable to be limited in this way, certain insects being attached to particular species of plants, and others to genera or families; and for this reason insects, in spite of the exceptional facilities for dispersal which many of them enjoy, are remarkable, as a rule, rather for the restriction of their areas of distribution than for their wide diffusion. Various other minor factors might be mentioned.

But a more generally operative organic barrier consists in the fact of a region being already fully occupied by a native flora and fauna, so that there is no room for new-comers. Hence it happens that seeds may be wafted in plenty from one country to another without a single plant growing from these seeds being able to establish itself; and there may even be, as in South America, a free communication with another region while the fauna remains strikingly distinct, simply because that portion of the American continent is already completely stocked with a fauna perfectly adapted to the physical conditions there prevailing.

The barriers to the spread of marine creatures are not so numerous as in the case of terrestrial forms. The freedom of communication between one part of the ocean and another makes it impossible to mark out any marine zoogeographical regions, though many seas and

coasts are distinguished by characteristic fishes and other marine creatures. The principal barriers for fish are temperature and the intervention of land. Thus, the Isthmus of Panama is at present a complete barrier for fishes requiring warm seas. See FISH, GEOGRAPHICAL DISTRIBUTION OF.

Geological Evidence.—If all the barriers to migration had existed in all past time as they are now, it would be quite impossible to explain the present distribution of plants and animals on the supposition that kindred groups have had a common birthplace. But the solution of the problems of distribution is to be found in the fact that all the barriers are liable to change. Of changes of sea and land geology supplies us with abundant evidence. Portions of the mainland now continuous were at one time severed by arms of the sea; and islands have been formed by the severance of portions of land that once belonged to the mainland. Such islands are known as continental islands, and the study of their faunas and floras is one of peculiar interest in connection with geographical distribution. These faunas and floras show, as might be expected, a greater or less degree of correspondence with those of the mainland from which the islands have been cut off; and the resemblance is the closer the more recently the land connection has been destroyed. The relative date of the disunion is usually approximately indicated by the depth of the sea which now separates island and mainland, shallow seas dividing portions of land that have only recently been disconnected, and deeper seas separating those which have been longer apart.

The most remarkable case of isolation is presented by the Australian region, the fauna and flora of which are the most peculiar in the world. In the widest sense, this region includes not only the vast island of Australia itself, but also New Guinea and all the Malayan and Pacific islands to the east of a deep channel between the islands of Bali and Lombok—a channel the significance of which, as a boundary line for plants and animals, was first pointed out by A. R. Wallace, the great authority on animal distribution, and hence known as Wallace's Line. The great feature of this region (so far as animal distribution is concerned)

"the almost total absence of all the forms of mammalia which abound in the rest of the world, their place being taken by a great variety of marsupials." The family just mentioned, though now restricted in the manner stated at the beginning of this article, was at one time spread over the whole world, but has in most parts become extinguished by the competition of later types; thus presenting one of the best examples of what are known as discontinuous areas of distribution, and offering an illustration of the mode in which such discontinuity is usually brought about. The early severance of the Australian region from the Asiatic continent (in the Mesozoic Age) saved the Australian marsupials from the competition which almost extinguished the group elsewhere.

Turning now to marine distribution, we find evidence of the former absence of a land barrier at the Isthmus of Panama in the identity of many species of fish on both sides of the isthmus.

Changes in the climatic barrier have also had

ZOOGEOGRAPHY

an important influence on geographical distribution; and it is by such changes, combined with changes in the continuity of land in the north polar regions, that the affinities between the floras of Japan and eastern North America must be explained. When these affinities were first pointed out by Asa Gray, that distinguished botanist divined the true explanation—namely, that in former geological epochs, a genial climate must have prevailed even within the polar circle, so as to allow of the existence of a remarkably uniform flora, suitable to such a climate, all round the pole in very high latitudes; and that as the climate became colder in the North this flora was driven southward, and became differentiated according to the differences of climate in the more southerly latitudes to which it advanced. Hence the eastern parts of America and Asia, as they correspond pretty much in climate, came to correspond also more closely than other tracts in the same latitude in the character of their floras. The soundness of

mammals, the regions adopted by Wallace are nearly the same as those first suggested by Sclater as applicable to the distribution of birds; for, in spite of the exceptional facility which birds have for crossing barriers impassable by mammals, Wallace finds that the distribution of mammals (which afford the best means of marking off zoogeographical regions) corresponds with that of birds to an extent that one would not perhaps have previously anticipated. But with regard to these regions it must be remembered (1) that it is impossible in most cases to draw any very clearly marked boundary line between one region and another; (2) that the degree of divergence between different regions is different in different cases; and (3) that, when any two regions are compared, we have not the same degree of divergence between different groups of the animal kingdom, or between animals and plants belonging to the two regions. Obviously, the degree of correspondence depends largely on the facilities for dis-

The Zoogeographical Regions according to Sclater and Wallace:

Sub-regions of Palaearctic Region —	Sub-regions of Oriental Region —	Sub-regions of Neotropical Region —
1. European.	1. Indian.	1. Chilean.
2. Mediterranean.	2. Ceylonese.	2. Brazilian.
3. Siberian.	3. Indo-Chinese.	3. Mexican.
4. Manchurian.	4. Indo-Malayan.	4. Antilean.
Sub-regions of Ethiopian Region —	Sub-regions of Australian Region —	Sub-regions of Nearctic Region —
1. East African.	1. Austro-Malayan.	1. Californian.
2. West African.	2. Australian.	2. Rocky Mountain.
3. South African.	3. Polynesian.	3. Alleghanian.
4. Malagasy.	4. New Zealand.	4. Canadian.

this surmise was afterward confirmed by the discovery of abundant plant remains of the Miocene Age, indicating a warm climate in Greenland, Spitzbergen, and elsewhere. The effects on distribution of the changes of climate belonging to the Glacial Period or Ice Age may only be alluded to here.

Zoogeographical Regions.—As the result of all the processes of dispersal across the various barriers to migration, and of the changes in these barriers, we have the present distribution of plants and animals, which is such as to enable us to divide the terrestrial surface of the globe into more or less well-marked regions. For

persal, and largely also on the geological age of different groups; and both of these are varying factors. These considerations being premised, we may now state briefly the limits of the six zoological regions adopted by Wallace, as given in his 'Island Life.' In the space to which the present article is necessarily restricted it is impossible to give even the most fragmentary sketch of the characteristic life of the different regions, for which the reader must be referred to the works cited at the end of the article.

(1) Palaearctic Region, including Europe and north temperate Asia and Africa to the northern borders of the Sahara.

ZOOLATRY—ZOOLOGICAL GARDENS

(2) Ethiopian or Palearctic Region, consisting of all tropical and South Africa, together with Madagascar and the Mascarene Islands.

(3) Oriental Region, comprising all Asia south of the Palearctic limits, and the Malay Islands as far as the Philippines, Borneo, and Java.

(4) Australian Region, the Papuan Islands, Australia, New Zealand, and the islands of Oceania. Celebes might be referred almost with equal right to this or the previous region. New Zealand is treated by Wallace as a highly peculiar sub-region of this great region.

(5) Nearctic Region, comprising all temperate and arctic North America, including Greenland, and extending on the south to an irregular line running from the Rio Grande del Norte on the east to a point nearly opposite Cape Saint Lucas on the west.

(6) Neotropical Region, the American continent south of this line, together with the West Indian Islands, sometimes called Neogaea.

Heilprin and others advocate the union of the Nearctic and Palearctic regions under the name of Holarctic, and introduce three transitional tracts (the Mediterranean, embracing southern Europe, northern Africa, and western Asia, south of the Caspian and west of India, but exclusive of the southern half of Arabia; the Sonoran tract, embracing the northwest of Mexico; and the Austro-Malaysian tract, embracing Celebes and the smaller islands lying between it and New Guinea and Australia). Otherwise his major faunal divisions of the globe are similar to those of Wallace.

On plant distribution the most important recent works are those of Engler and Drude. Engler attempts to trace the history of the vegetable kingdom since the Tertiary period, and comes to the conclusion that already in the Tertiary period four "floral elements" (*Floraelemente*) could be distinguished, namely:

(1) The Arcto-tertiary element, characterized by an abundance of conifers and numerous genera of trees and shrubs now prevalent in North America, or in extratropical eastern Asia and in Europe.

(2) The Palearctic element, characterized by the presence of the families and subfamilies dominant in the tropics of the Old World; and still more by the absence of certain families, groups, and genera found in the territory of the Arcto-tertiary element.

(3) The Neotropical or South American element, which, according to Engler, must have had in Tertiary times much the same character as that now possessed by tropical Brazil and the West Indies.

(4) The old Oceanic element, consisting of forms which possessed the power of traversing considerable stretches of ocean and developing further on islands.

The modern provinces of the vegetable kingdom are subordinated by Engler to these great divisions. Drude, in the first place, distinguishes the oceanic (marine) flora from the terrestrial forms, and the latter he divides into three great groups, and these again into 14 floral domains. See PLANT GEOGRAPHY.

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Zoöl'atry, the worship of animals. This seems to have passed through three stages: (1) The animal was revered and propitiated as possessing a power greater than that of man. (2) The animal was regarded as an incarnation of some deity or spirit. (3) It was raised to the position of a tribal ancestor. In the early history of the human race zoöl'atry of some kind was very prevalent. Traces of it appear in the Bible, as in the story of the Golden Calf made by the Israelites (Ex. xxxii.). Zoöl'atry took deep root in the religious life of the ancient Egyptians, and all three forms flourished among that people. Juvenal opens his 15th satire with a scathing invective of Egyptian zoöl'atry, and detailed accounts of it occur in Herodotus, Plutarch, Strabo, and Cicero. In classic times the chief form of zoöl'atry was serpent worship, though traces of other forms occur in the transformation myths of the poets. In the present day zoöl'atry survives chiefly in India and among the snake-worshippers of the west coast of Africa. See NATURE WORSHIP.

Zoological Gardens, or Parks, places for the keeping and attractive display of living animals, where they may live, as far as possible, in the open air and under natural conditions; a zoological garden thus differs from a menagerie, as that term is now understood, in that in the latter the animals are confined in narrow prison-cages, under cover, and are usually borne from place to place to be displayed for a fee. Collections of captive animals have always been kept by royal and eminent persons, and formed a large element in the sights and amusements of the populace in ancient and mediæval cities. The present conception of zoological collection, as a place where animals shall be maintained in the greatest practicable freedom for the sake of exhibiting their traits to the student, and shall be regarded only secondarily as objects of curiosity, is a modern idea, and one that has been developed to its highest degree in the United States. Many large cities of the Old World have "zoos," as they are popularly called, notably London, Dublin, Berlin, Paris, Vienna, Amsterdam, Rotterdam, Antwerp, Hamburg, Copenhagen, Hanover, Cologne, Bombay, Calcutta, Tokio, Melbourne, and several South American cities, especially Rio de Janeiro and Buenos Ayres. All of these are the property of a society or private ownership of some sort except the garden in Berlin, and that attached to the Museum of Natural History at the Jardin des Plantes, in Paris. They are sustained, therefore, partly by membership subscriptions, and partly by gate-receipts, but most or all of them give free days. The sale of animals born and reared within their precincts is a source of revenue with some, as, for instance, the Dublin garden which has supplied a large proportion of all the lions now held in captivity by circus and traveling menageries. The Berlin "zoo"

1. Crawshay's Zebras, in the New York Zoological Park.
2. White-tailed Gnu, in the New York Zoological Park.

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ZOOLOGICAL LABORATORIES—ZOOLOGY, HISTORY OF

stands first in the number of its animals and general excellence of arrangements; but that of London, founded in 1828, is nearly its equal; and the splendid series of volumes constituting the 'Proceedings' and 'Transactions' of the Zoological Society of London attest the admirable use which has been made of the collection by naturalists.

Zoological gardens have long existed in the United States, among the oldest being those at Cincinnati and Philadelphia, both privately sustained, and each highly creditable. To these were added collections of living animals in the parks of various cities, maintained by municipal appropriation, among which those in Central Park, New York; Schenley Park, Pittsburgh; Lincoln Park, Chicago; Belle Isle, Detroit; and Golden Gate Park, San Francisco, are important.

The National Zoological Park at Washington was established in 1889, in a large tract of hilly and forested land along Rock Creek in the outskirts of Washington. Its prime purpose was to gather a representative collection of American animals and possibly preserve from extinction species threatened with racial destruction. It has extensive and highly picturesque grounds, and its collection of animals have remarkably favorable surroundings and are kept in admirable condition. The support of this free park, one half of which comes from Congress and one half from the District of Columbia, has not been sufficiently liberal to make its development as rapid as its friends desire.

The latest and foremost American zoological park is that in the northern part of the city of New York, which is under the control of the New York Zoological Society, to which the city granted 261 acres of land in Bronx Park, police protection, and various aids and immunities. This is the largest and most suitable space devoted to the care and exhibition of animals anywhere in the world; and since its opening in 1897 it has developed into a most prominent and useful position among the world's institutions of this kind. The society had in 1904 about 1,500 members, and had begun the issue of a series of important periodical publications. This park has been developed and remains under the care of William T. Hornaday.

Zoological Laboratories and Stations. See LABORATORY.

Zoology, that branch of biology, or the science of living things, which treats of animals. The scope of the science may be gathered from the following enumeration of its main branches: (1) *Morphology*, which treats of the outer form and internal structure of animals, their anatomy, histology, physiology, etc.; (2) *Embryology*, or ontogeny, treating of the development of individual animals from their earliest discernible stage; (3) *Therematology*, treating of breeding or propagating animals and plants under domestication, of their congenital variations under these circumstances, and of the perpetuation of such variations; (4) *Paleozoology*, or animal paleontology, treating of fossil animals; (5) *Phylogeny*, which seeks to investigate the evolution of the various groups or types of animals; (6) *Taxonomy*, or *Systematic Zoology*, treating of the classification of animals,—their arrangement in

groups determined by genetic relationships; (7) *Bionomics*, or *Ecology*, which investigates the conditions of life as a whole, habits, instincts, etc.; (8) *Zoogeography*, dealing with the distribution of animals on the surface of the earth. So comprehensive a view of zoology is a modern conception and has resulted from the conviction of the unity of organic nature and the kinship of descent which pervades the whole realm of beings, past and present. In the earlier days of the study of nature each group of animals was considered by itself, and to each such study was naturally given a name, many of which survive as convenient terms in descriptive zoology. Such are *Conchology*, the study of shells (of mollusks), and hence the study of the *Mollusca*; *Entomology*, the study of insects; *Herpetology*, the study of reptiles (popularly including amphibians); *Ornithology*, the study of birds; and so on. For detailed information upon animals and the various aspects of their instigation consult articles under their names, as birds, horse, pompano, etc.; under the technical names of groups, as Carnivora, Camelidae; and under such terms as Ichthyology, Herpetology, and the like. See also ANATOMY; ANIMAL HEAT; BIOLOGY; BIONOMICS; BREEDING; CELL; COLORATION; PROTECTIVE; DARWINIAN THEORY; EMBRYOLOGY; EVOLUTION; GROWTH; HEREDITY; HYBRIDITY; INSTINCT; LAMARCKISM; LIFE; MIMICRY IN NATURE; MIGRATION; NATURAL SELECTION; ORGANS; PALEONTOLOGY; REPRODUCTION; WEISSMANISM; ZOOGEOGRAPHY, and related topics. In zoology. See SPORTS IN PLANTS.

Zoology, History of, the record of discovery in the science of zoology. The history of zoology may be regarded as beginning with Aristotle (384-322 B.C.), whose works reveal a classification of animals into the two main groups of Enema or blood-containing animals and Anama or bloodless animals, the former including the four classes of viviparous enema, equivalent to mammals, birds, four-footed, egg-laying enema, equivalent to reptiles and amphibians and fishes; and the last included the four classes of soft-bodied enema (cephalopods), soft-shelled enema (crabs and insects), and shell-bearing enema (mollusks and echinoderms). Among Aristotle's successors in zoological investigation in ancient times were Herophilus and Erasistratus (3d century B.C.), both physicians who contributed to the progress of anatomy (q.v.); the elder Pliny (23-79 A.D.), who wrote a most uncritical work on natural history; and Galen (131-200 A.D.), who is chiefly important as an anatomist and physician. The mediæval period witnessed no further progress in zoology, and the bestiaries (q.v.), and books severally known by the title 'Physiologus' are of no scientific value. The revival of the study of Aristotle effected a change for the better, but modern zoology does not begin till the era of the Renaissance.

Modern History to Linnaeus.—The discovery of new countries at the beginning of the modern period greatly increased the number of known animals, and it was accompanied by the growth of the scientific spirit. Extensive collections began to be formed, and in the 17th century academies and societies were founded for the promotion of scientific research. One of the oldest of these institutions was the Académie

ZOOLOGY, HISTORY OF

Nature Curiosorum, established at Schweinfurt in 1651, and it was soon followed by the Royal Society of London and the Academy of Sciences of Paris. In his work 'De Differentiis Animalium' (1552), Edward Wotton (1492-1555) presented Aristotle's zoological teaching without its mediæval accretions, and extended his master's classification by adding the group *Zoophyta*, in which he included holothurians, star-fishes, sea-anemones, sponges, etc. The work of the zoological revival was carried forward by, among others, Conrad Gesner (1516-65), whose 'Historia Animalium' (1551-8) may be regarded as an epoch-making work; Ulisse Aldrovandi (1522-1605); John Johnstone (1603-75), the last of the encyclopædists, who published a complete survey of the animal kingdom in four treatises (1649-53); Pierre Belon (1517-64), who wrote on fishes (1551), and birds (1555); Hippolyto Salviani (1514-72), author of a work on fishes; Guillaume Rondelet (1507-56), whose monograph on fishes is the chief of its time; Andreas Vesalius (1514-64), an anatomist; Hieronymus Fabricius (1537-1619), a pioneer in comparative anatomy; Thomas Willis (1621-75), who is of importance in the history of anatomy; Marco Aurelio Severino (1580-1656), an anatomist; Marcello Malpighi (1628-94), one of the pioneers in the application of the microscope to zoological investigation; Anton van Leeuwenhoek (1632-1723), another early microscopist of renown; Jan Swammerdam (1637-85), whose microscopic researches on insects, molluscs, and other animals were of the utmost value; Robert Hooke (1635-1703), of importance in the history of the microscope; William Harvey (1578-1657), who demonstrated the circulation of the blood and contributed in other ways to anatomical and physiological progress; Edward Browne (1644-1706), who made many dissections of animals; and Edward Tyson (1650-78), the first Englishman who published elaborate monographs of particular animals. John Ray (1627-1705), great as a botanist, is even greater as a zoologist. He did more for the science of animal life than any other man between Gesner and Linnæus, and he has been justly called the father of modern zoology. He made zoological classification more truly scientific by clearly fixing the meaning of the term "species" and by using anatomical characters in the determination of the larger groups. With his name we may associate that of his friends Francis Willughby (1635-72) and Martin Lister (1638-1712), and Lister's friend, Edward Lhwyd (1660-1709). Among other zoologists of note in the interval between Ray and Linnæus are Alexander Monro (1697-1767), a good comparative anatomist; Johann Philipp Breyn (1660-1764); Maria Sibylla Merian (1647-1717), who wrote on insects; Johann Leonhard Frisch (1666-1743), author of a description of the insects of Germany; René Réaumur (1683-1757), a distinguished entomologist; Johann Heinrich Linck (1674-1734); Jean Antoine Peyssonet (b. 1694), who established the animal nature of polyps; Jacob Theodor Klein (1685-1759), who proposed a purely artificial classification of animals, and John Woodward (1665-1728), an early paleontologist.

Linnæus to Cuvier—Karl von Linné (1707-78), usually called Linnæus (q.v.),

marked a new era in both botany and zoology. He introduced the binary nomenclature of species, and he gave the science a fixed terminology. In his 'Systema Naturæ' (1735) he gave the first entirely modern classification of animals, using in his scheme the descending series of terms, class, order, genus, species, and variety, which has ever since been used in the same way for the purposes of classification. His classes are: I. *Mammalia*, with the orders Primates, Bruta, Ferae, Glres, Pecora, Bellum, and Cete; II. *Aves*, with the orders Accipitres, Picæ, Anseres, Grallæ, Gallinæ, and Passeres; III. *Amphibia*, with the orders Reptilia, Serpentes, and Nantes; IV. *Pisces*, with the orders Apodes, Jugulares, Thoracici, and Abdominales; V. *Insecta*, with the orders Coleoptera, Hemiptera, Lepidoptera, Neuroptera, Hymenoptera, Diptera, and Aptera; VI. *Vermes*, with the orders Intestina, Mollusca, Testacea, Lithophyta, and Zoophyta. The principal zoologists of the period from Linnæus to Cuvier are the following: Johann Friedrich Gmelin (1748-1804), who edited the 13th edition of Linnæus' 'Systema'; George Louis L. Buffon (1707-88), author of a famous natural history (1749-88); Charles Bonnet (1720-93), known chiefly as an entomologist; O. F. Müller (1730-84), author of a fauna of Denmark; Thomas Pennant (1726-98), who wrote on the British zoology; Eberhard A. W. von Zimmermann (1743-1815), a pioneer in zoogeography; Peter Simon Pallas (1741-1811), who investigated and wrote on the fauna of Russia and Siberia; Mathurin J. Brisson (1733-1806), chiefly an ornithologist; Johann P. Eberhard (1727-79); Johann C. D. von Schreber (1739-1810); Johann C. Erxleben (1744-77); John Latham (1740-1837), and George Edwards (1694-1773), ornithologists; Bernard Lacépède (1756-1825), a student of reptiles, fishes, cetaceans, etc.; Johann G. Schneider (1750-1822), who wrote on the amphibians; Marcus E. Bloch (1723-99), an ichthyologist; Jean G. Brugnières (1750-98); Johann H. Chemnitz (1730-1800), a conchologist; Karl de Geer (1720-78), an entomologist; Johann C. Fabricius (1743-1808), a very eminent entomologist; Johann K. W. Illiger (1775-1813), another entomologist; P. Lyonnet (1707-89); Abraham Trembley (1700-84), who investigated fresh-water polyps; John Ellis (1710-76), who advanced our knowledge of corallines; Daniel C. Solander (1736-82), who assisted Ellis; Sir Joseph Banks (1743-1820); Jacques F. Dictionnaire (1733-89), a writer on sea-anemones; Filippo Cavolini (1756-1810), a student of marine polyps and fishes; Martin F. Ledermüller (1719-69), who introduced the term Infusoria; Albrecht von Haller (1708-77), an eminent anatomist and physiologist; John Hunter (1728-93), an eminent anatomist; Lazaro Spallanzani (1729-99), a physiologist; Marie F. X. Buchat (1771-1802), the founder of histology; Kaspar Friedrich Wolff (1733-94), whose dissertation entitled 'Theoria Generationis' (1759) is the starting-point of modern embryology; Jean Baptiste Lamarck (1744-1829), who fixed the two groups of *Vertebrata* and *Invertebrata*, and whose 'Philosophie Zoologique' (1809) is of the utmost importance in the history of the evolution theory; and the co-called nature-philosophers, including J. W. von Goethe

1. Rhinoceros Iguana, in the New York Zoological Park.
2. Gila Monster in the New York Zoological Park.

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ZOOMORPHIC

(1749-1832); Lorenz Oken (1779-1851), and others, who also contributed materially to the development of evolutionary conceptions.

Cuvier to Darwin.—George Cuvier (1769-1832) is the only name of supreme importance in zoology between Linnæus and Charles Darwin. He rejected the view, held by Lamarck, that a linear classification of the animal kingdom is possible, and in his great work, 'Le Règne Animal' (1817), he grouped his classes in four embranchements, representing four fundamentally distinct types of structure. These branches, with their contained classes, are as follows: *Vertebrata*, including Mammalia, Birds, Reptiles, Fishes; *Mollusca*, including Cephalopoda, Pteropoda, Gasteropoda, Acepala, Brachiopoda, Cirrhopoda; *Articulata*, including Annelides, Crustacea, Arachnides, Insects; and *Radiata*, including Echinoderma, Intestinal Worms, Acalephæ, Polypi, Infusoria. He raised comparative anatomy to the dignity of a true science, and he carried out researches of the utmost value in palæontology. In the restoration of extinct animals from remains of parts he used his law of the correlation of parts according to which animals are so constituted that single organs or parts can serve as an index to all other parts and to the general structure. Of the numerous workers who advanced the study of zoology from Cuvier's time down to that of Charles Darwin we can only name the following: Geoffroy Saint-Hilaire (1772-1844), who opposed Cuvier's view regarding types; Johann F. Blumenbach (1752-1840), a distinguished comparative anatomist and physiologist; Ignaz Döllinger (1770-1841), an eminent anatomist and physiologist; Friedrich Tiedemann (1781-1861), also distinguished in anatomy and physiology; Karl A. Rudolphi (1771-1832), who wrote on physiology and intestinal worms; Karl Ernst von Baer (1792-1876), a most distinguished embryologist; C. H. Pander (1794-1865), also an embryologist; Martin H. Rathke (1793-1860), another eminent embryologist; Theodor Schwann (1810-82), the founder of the cell-theory; Johannes Müller (1810-58), 'the greatest of all investigators of animal structure' in his century; Sir Richard Owen (1804-92), a great morphologist of the Cuvierian school, who introduced the conceptions of homology and analogy in regard to animal parts; Michael Sars (1805-69); Johannes J. S. Steenstrup (1813-97), who first emphasized the fact of alternate generation; Rudolf Leuckart (1822-98), who founded the sub-kingdom of Coelenterata and set forth the phenomena of polymorphism; Karl T. E. von Siebold (1804-85), who established the sub-kingdom Protozoa, Louis Agassiz (1807-73), a distinguished student of fossil fishes who held to Cuvierian traditions to his death; Christian G. Ehrenberg (1795-1876), who shed much fresh light on the Infusoria; Edward Forbes (1815-54), a distinguished investigator of the British marine fauna; Alcide D. D'Orbigny (1802-57), a palæontologist; Félix Dujardin (1801-60), who did valuable work on Infusoria, intestinal worms, and Medusæ; Antoine R. E. Claparède (1832-71), who wrote on Infusoria and Rhizopoda in collaboration with F. J. Lachmann (1832-61); William B. Carpenter (1813-85), an eminent physiologist and almost universal naturalist; Robert E. Grant (1793-

1874), a pioneer in the more exact study of sponges; Max J. S. Schultze (1825-74); James S. Bowerbank (1797-1877), who did splendid work on the sponges; Henri Milne-Edwards (1800-85), whose special work was done on crustaceans, corals, and mammals; Johann F. Eschscholtz (1793-1831), known by a treatise on the Acalephæ; Stefano della Chiaje (1794-1860), who described Sicilian invertebrates; Jean L. A. Quatrefages de Bréau (1810-92); Emile Blanchard (1820-1900), author of works on insects, Pierre A. Latreille (1762-1833), best known by his work on insects; William Kirby (1759-1850), an entomologist; Hermann Burmeister (1807-92), an entomologist and writer on the Brazilian fauna; Albany Hancock (1806-73), who studied the Mollusca, Tunicata, and Brachiopoda; Henri M. Ducrotay de Blainville (1776-1850); and John V. Thompson (1779-1847), who proved the crustacean character of Cirripedes and investigated the Polyzoa, the feather-star, etc.

Darwin and After.—The theory of the fixity of species was challenged at various times by different zoologists, notably by Lamarck, but it was not till the publication of 'The Origin of Species' (1859) by Charles Robert Darwin (1809-82) that the old view became generally abandoned and the evolution or development theory took its place. This has completely transformed the whole outlook of the zoologist and has brought new branches of the science into being, notably thremmatology. It makes the tree-like classification to which systematists have steadily advanced a truly genealogical tree, and it has contributed enormously to the progress of what may be called philosophical zoology. The natural-selection principle was independently discovered at practically the same time by Alfred R. Wallace (1823-), the eminent naturalist-traveler. Herbert Spencer had also formulated an evolution theory, extending to the whole of nature and life. Thomas Henry Huxley (1825-95), master of an admirably lucid and attractive method of exposition, and Ernst Hæckel (1834-), have done admirable work in embryology and other branches of zoology, and have contributed much to developing and popularizing the Darwinian views. August Weismann (1834-) is best known by his valuable contributions to the doctrine of heredity. The number of other zoologists who have done good work during the Darwinian period and under the influence of the Darwinian conceptions is so great that no attempt will be made to enumerate them.

Bibliography.—Lamarck, 'Philosophie Zoologique' (Paris 1809); Carus, 'Geschichte der Zoologie' (Leipzig 1872); Spencer, 'Principles of Biology' (London and New York 1898); Osborn, 'From the Greeks to Darwin' (New York 1894); 'Zoological Record' (London, annually).

Zoömorphie, a word meaning, pertaining to or exhibiting animal forms. In anthropology, representing a god or other supernatural being under the form of one of the lower animals. The zoömorphie element in classic mythology appears in such cases as that of the Sminthean Apollo, and the metamorphoses of Jupiter; it is very strongly marked in the religion of ancient Egypt, and traces of it may be found among the Jews and in the Apocalypse.

ZOOPHYTE—ZOROASTER

Zoöphyte, a term meaning literally animal plants, borrowed from Aristotle by Cuvier, and used by him as a synonym of *Radiata*. The term has no longer any specific value, but is often loosely applied as a designation for many plant-like animals, as sponges, corals, etc., more or less resembling plants in appearance.

Zöpfl, tsépfl, Heinrich, German legal scholar. b. Bamberg, Upper Franconia, Bavaria, 6 April 1807; d. Heidelberg 4 July 1877. Educated at Würzburg, he became a lecturer at Heidelberg in 1828, in 1839 professor extraordinary of constitutional law, and in 1842 professor ordinary. He was elected university representative in the first chamber of Baden in 1850, and sat in the Unionsparlament at Erfurt. Among his works are: 'Grundsätze des Gemeinen Deutschen Staatsrechts' (1841; 5th ed. 1863), and 'Deutsche Staats- und Rechtsgeschichte' (1833-6; 4th ed. as 'Deutsche Rechtsgeschichte', 1871-2).

Zoré's Islands, East Indies. See **XULLA ISLANDS**.

Zorgite, a mineral from Zorge and Tilkerode in the Harz. Massive; brittle; hardness, 2.5; specific gravity, 7 to 7.5; lustre, metallic; color, lead or sometimes yellowish gray. A sesquioxide of lead and copper in varying amounts.

Zorilla, thò-rèl'yà, Manuel Ruiz, Spanish statesman: b. Burgo de Osma, province of Soria, 1834; d. Burgo 13 June 1895. He studied law at Valladolid and became an advocate at Madrid, where in 1856 he was chosen to the Cortes, in which he identified himself with the Progressive party, and displayed a vigorous hostility against the Neo-Catholics. Banished in consequence of the insurrection of June 1866, he remained in France until the revolution of 1868, when Serrano appointed him minister of commerce, education, and public works. In 1869-70 he was minister of justice, and later president of the Cortes. He was a supporter of Duke Amadeus of Aosta for the Spanish throne; and when the latter became Amadeus I., was made minister of religious affairs. In 1872 he assumed the head of a radical ministry, but after Amadeus' abdication retired. On account of participation in the military revolt of March 1884, he was sentenced to death. He finally returned unharmed to Spain. Consult Villareal, 'Ruiz Zorilla desde la Expulsion de España hasta su Muerte 1875-95' (1903).

Zorn, tsörn, Anders Leonard, Swedish painter: b. Utmedal 18 Feb. 1860. He studied sculpture and painting at the Stockholm Academy. In 1882 he settled in London, where he attained special success as a portrait painter; and in 1889 went to Paris. He traveled widely in Sweden, Italy, Spain, England, the United States, and elsewhere; while in the United States he painted several portraits. His work includes landscape, genre, and portrait painting, as well as etchings of great merit. Among his paintings are 'Irish Maidens'; 'The Toast'; 'Italian Street Scene'; 'Summer in Sweden,' and portraits of Renan and of King Oscar; his etchings are mostly copies of his own paintings.

Zorn, Philipp, German jurist: b. Bai-reuth 13 Jan. 1850. After study at Munich and Leipzig, he became a lecturer at Munich in 1875, and in that year went as professor to

Bern. From 1877 he was at Königsberg, and in 1900 took a chair in the legal faculty at Bonn. In 1899 he participated as an expert in the Peace Conference at The Hague. Among his works are: 'Staat und Kirche in Norwegen bis zum Ende des 13ten Jahrhunderts' (1875); 'Staat und Kirche in der Schweiz' (with Gareis 1877-8); 'Staatsrecht des Deutschen Reichs' (2d ed. 1894-7); 'Deutsche Kolonialgesetzgebung (1901); and 'Die Deutsche Staatsprache' (1903).

Zorndorf, tsörn'dörf, Germany, a village of Brandenburg, Prussia, 53 miles northeast of Berlin. It is celebrated for the Prussian victory over the Russians 25 Aug. 1758, the Russians losing 21,539 men, and the Prussians about 11,000. See **SEVEN YEARS' WAR**.

Zoroaster, zò-rò-äs'tér (from Gr. *Zoroastros*; Avestan, *Zarathushtra*; Persian, *Zardusht*), the founder of the Parsee religion. The life of Zoroaster is completely enveloped in legend, and except from the work he has accomplished little or nothing can be discovered regarding it. In later times, when his religion was fully established, he was almost worshipped as a divine being, considered as above the archangels and next to God, and then the actions attributed to him are supernatural, and his history legendary; but even in the later accounts of the Zend-Avesta there is a manifest reference to a human original, and we may see in their exaggeration the gratitude inspired by the active benevolence of a good man and great reformer. 'He first thought good thoughts, first spoke good words, first performed good actions. He was the first priest, first warrior, and first cultivator of the soil. He first caused the wheel to turn among gods and among men.' This particularity may perhaps indicate that the date of Zoroaster was not so remote as it has sometimes been placed. His history was already legendary in the time of Aristotle, who placed him 6,000 years before Plato; others have supposed him to be contemporary or identical with Moses. The latest date generally assigned to him is the 6th century a.c. Modern researches place his period not later than 1000 a.c., or perhaps several centuries earlier. He lived in the reign of Vitaca or Gushtasp, a king of the Bactrian dynasty of Kávia, anterior to the time of the Median and Persian monarchies. This king was a zealous propagator of the religion of Zoroaster. Bactria was the scene of Zoroaster's labors, and thence his religion spread over Media and Persia. He appears to have been one of the Soshyantos or fire-priests of the early Iranian religion. According to the theory approved by scholars, the nomad Aryans first settled to agricultural life in Bactria. These settlers, the ancestors of the Iranian races, became alienated from their brethren who continued the nomad life, and, suffering from their depredations, at length came to regard even their religion with abhorrence, and placed their gods among the devils of their own creed. The new religion of the Iranians recognized a plurality of good spirits called Ahuras, which were opposed to the Devas of the Brahmanical creed. It was while the national religion was in this transitional stage that Zoroaster appeared and molded the discordant elements of the national faith into a new system, the fundamental principle of which was monotheism. He called the

ZOROASTRIANISM—ZOUCHE

supreme being, to whom he directed that worship should be exclusively paid, Ahurō Mazda, the Ahura who is the creator of the world. This name has been successively modified into Ahuramazda in the cuneiform inscriptions, and Ormuzd (q.v.) among the modern Parsees. Zoroaster is said to have called himself a reciter of manthras, a messenger of Ahuramazda, one who received sacred words from Ahuramazda through the flames. The descriptions he gives of the nature of God are full of the most exalted conceptions; he calls him the Creator of the earthly and spiritual life; he who taught the suns and stars their way. He is not only a Creator, but an intelligent and moral ruler. While the views of Zoroaster's teaching derived from the earlier Gāthas thus represent him as inculcating a pure and elevating religion, a speculative philosophy is ascribed to him which not unnaturally led to misconceptions of his theology, and speedily corrupted the religion he established. He imagined two principles which exist in all things, and are respectively the causes of all good and evil. These he called the Vohu Mano, or good mind, and the Ahem Mano, or naught mind; they are twins, and though opposed are inseparable, being apparently the necessary opposites of each other. The one creates day and the other night; the former produces life, and the latter extinguishes it. These two minds exist in Ahuramazda as well as in all created things. Such is Zoroaster's account of the origin of good and evil in the universe. Subsequent interpreters of his religion soon developed these two principles into two distinct and powerful beings, Ormuzd and Ahriman, the good and evil spirits, and gave to each of them a court of attendant ministers or councillors, six in number, so that a hierarchy of good and evil spirits, seven of each kind, was again established as an object of worship. The first of the angels of Ahuramazda is Vohu Mano, the good mind of Zoroaster, who is represented as the son of Ahuramazda; after him comes Ardibehst, who is represented as the blazing flame of fire. He is the preserver of life, and represents the omnipresence of Ahuramazda. Others preside over wealth, devotion, vegetation, etc. Besides the seven spirits there is an archangel Sraosha, who is possessed of great powers, and was the medium of revelation to the prophet. He first sang the five Gāthas of Zarathustra Spitama. He is the judge of men after death, and is worshipped for his power and purity. The dualism of the Persian creed is first developed in the Vendidad, which Haug dates partly as early as 1000 a.c., partly as late as 500 a.c. A small party continued to protest against the Zendic interpretation in favor of the ancient doctrine of Zoroaster as taught in the earlier Gāthas. They are said to have fallen into an opposite error of making the words Zervana Akarana, which simply mean time without bounds, into an independent being anterior to Ahuramazda. Among the doctrines of the Zend-Avesta are the distinction of a natural and a spiritual life, and a belief in immortality. Heaven is called the House of Hymns, and Hell the House of Destruction. Between heaven and hell is the Bridge of the Gatherer or Judge over which the good pass with safety, while the wicked are precipitated from it into hell. The resurrection of the body, the coming of a Messiah, Sosiosh,

son of Zarathushtra, and a final judgment, are foretold. Sosiosh is to be the last of three great prophets who are to precede the end of the world. The detailed description of the last judgment is contained in the Bundehesh. How far these doctrines are to be ascribed, as some hold, to Zoroaster, is doubtful. Consult Spiegel, 'Eranische Altertumskunde,' Vol. I. (1871); Haug, 'Essays' (2d ed. 1878); Brodbeck, 'Zoroaster' (1893). See also AVESTA.

Zoroastrianism. See ZOROASTER.

Zorrilla y Moral, José, hō-sā' thōr-rél'yā ē mō-rā'l, Spanish poet: b. Valladolid 21 Feb. 1817; d. Madrid 23 Jan. 1893. He studied for the law at Toledo and Valladolid, but turned to literature. His attempts in politics showed him to be unfitted for such a career. From 1855 to 1866 he was in Mexico, latterly at the court of Maximilian. His plays, of which 'Don Juan Tenorio' is probably the best, are without finish, but have continued effective through their distinctively native quality and their adaptability to theatrical requisites. His 'Leyenda de Alhama,' 'Granada,' and 'Leyenda del Cid' were picturesque presentations of national legends in the general manner of Scott, and very popular. Zorrilla was not a careful artist, but an improvisator of great readiness and skill, both lyrical and dramatic. A bronze memorial was erected to him in Madrid in 1900. An account of him may be found in the autobiographic 'Recuerdos del Tiempo Viejo' (Old-Time Memories, 1880-3). There is a three-volume collection of his works.

Zosimus, zōs'i-mūs (Gr. *Ζωσίμος*), Greek historian of the 5th century A.D. He wrote a history of the empire in six books, which is frequently referred to by Gibbon. He begins with the change of constitution introduced by Augustus, and his first book brings him to the reign of Diocletian, 305 A.D.; in the second, third, and fourth books the history of the 4th century is given with more detail; the fifth and sixth books are occupied with the period from 395 to 410. From internal evidence the work must have been partly written after 425. Zosimus was a pagan, and severely criticised the Christian emperors, making the change of religion largely responsible for the decline of the empire. The best editions are those of Bekker (1837) and Mendelssohn (1887).

Zostera, a genus of marine grasses. See EEL-GRASS.

Zotal. See MERCAL.

Zouave, zōo-āv, a soldier in the French army. Zouaves were originally mercenaries belonging to a Kabyle tribe. The Zouaves in the pay of the dey of Algiers were, when Algeria became a French possession, incorporated with the French army there, preserving their Arab dress. Ultimately the native element was eliminated, and the Zouaves became merely French soldiers in the picturesque Arab costume. As such they distinguished themselves in the Crimea and the Franco-Italian war of 1859. There were several regiments of zouaves among the Federal troops in the American Civil War.

Zouche, Richard, English legal scholar: b. Anstey, Wiltshire, 1590; d. London 1 March 1661. He was educated at New College, Oxford; in 1617 was admitted an advocate of Doctors' Commons; and in 1620 became regius

professor of civil law at Oxford. In addition to his university duties, he had a large practice in London. In 1641 he was made judge of the high court of admiralty. He was a royalist, though not a pronounced one, at the civil war; and although replaced in the judgeship in 1649, was nevertheless appointed by Cromwell to a special commission of oyer and terminer. He was restored to the bench in 1661. His writings include a descriptive poem, 'The Dove, or Passages of Cosmography' (1613); a comedy, 'The Sophister' (1639); and many works of a professional sort, most important of which are 'Elementa Jurisprudentiæ' (1629), a general system of legal science, and 'Juris et Judiciis Fecialis Explicatio' (1650), regarded by critics as the first treatise containing a systematized arrangement of what is now known as international law.

Zrinyi, zrén'yê, Niklas, Count, Hungarian soldier: b. 1508; d. Szigetvár 7 Sept. 1566. He distinguished himself in the siege of Vienna by Charles V., and in campaigns against John Zápolya and Sultan Suleiman. As ban of Croatia from 1542, he defended that territory against the Turks, and became famous for his defense of Szigetvár (or Sziget) in 1566. His garrison of scarcely 3,000 was reduced to 600, and on 5 September the enemy succeeded in firing the outer fortifications. Zrinyi retreated to the inner fortress, but this also was soon on fire. He thereupon ordered the gates to be opened, and after firing a mortar filled with broken iron into the midst of the Turks, who were urging along a narrow approach to the castle, led a sally of the garrison. He fell, mortally wounded, and the defenders were forced back; but a slow match ignited 3,000 pounds of gunpowder stored within, and great carnage among the Turks ensued. The catastrophe has been made by Theodor Körner the subject of his 'Zrinyi. Ein Trauerspiel.'

Zschokke, chök'kê, Johann Heinrich Daniel, German author: b. Magdeburg 22 March 1771; d. Biberstein 27 June 1848. He quitted his native place in 1788, and for some time wandered about the country as play-writer to a strolling company of actors; but afterward studied at the University of Frankfurt-on-the-Oder. In 1792 he commenced life there as a private teacher, and produced several pieces for the stage. He subsequently settled down in the canton of the Grisons and became director of an academy at Reichenau, where he wrote a history of the Grisons (1798). He then became head of the department of public instruction at Aarau, and was soon afterward sent by the Helvetic executive directory to Unterwalden as government commissioner, for the purpose of restoring tranquillity. He acquitted himself so satisfactorily that his powers as commissioner were extended to the cantons of Uri, Schwyz, and Zug. In 1800 he was appointed commissioner for the organization of the Italian territories of Switzerland. In 1804 he became a member of the board of mines and forests; and in the same year began the issue of his highly popular 'Schweizerbote' (Swiss Messenger). Through the greater part of his life Zschokke appeared as one of the most distinguished and energetic public men in Switzerland, but he found time to cultivate his favorite

literary pursuits, and it is chiefly by his numerous writings, historical and fictitious, that he is known to the world at large. Among his works may be mentioned: 'Ueberlieferungen zur Geschichte unserer Zeit' (1811-27) (Contributions to the History of Our Time); 'Des Schweizerlandes Geschichte für das Schweizer-volk' (1822); (History of Switzerland for the Swiss People), one of the best of his works; and 'Bilder aus der Schweiz' (1824-6) (Pictures from Switzerland). As a writer of tales he possesses a European reputation, and among them we may refer more especially to 'The Creole,' 'Alamontade,' 'Jonathan Frock,' 'Clementine,' 'Oswald or the Goldmakers' Village,' and 'Master Jordan.' The work, however, which has had the most extended circulation is his 'Stunden der Andacht' (Hours of Devotion) (1809-16; last ed. 1901-2), which, though rationalistic, has yet, from the pious feeling pervading it, found admirers among all classes of readers. Consult the studies by Münch (1831); Keller, 'Beiträge zur Politische, Thatigkeit Zschokkes' (1887); and Wernly (1894).

Zuazo, thoo-ä'thō, Alonso, Spanish jurist in the New World: b. Olmedo 1466; d. Santo Domingo 1527. A learned canon of Valladolid, he was appointed jurist of the commission which, at the request of Las Casas, was sent to the New World. He was given authority to organize justice in the West Indies, and to appoint judges. For his opposition to the complete abolition of enforced labor, he was denounced by Las Casas; although in Santo Domingo he emancipated the Indians who had been held in slavery by the officials. In 1518 he was despatched to Cuba to systematize the administration of justice in the island, and from 1525 until his death was auditor of the audiencia of Santo Domingo. Icazbalceta, in the 'Colección de Documentos para la Historia de México' (1858-66), gives an interesting narrative, written by Zuazo from Cuba in 1521, regarding the condition of the natives there and in Santo Domingo.

Zubly, John Joachim, American Independent Presbyterian clergyman: b. St. Gall, Switzerland, 1725; d. Savannah, Ga., 23 July 1781. The date of his arrival in America is unknown; but in 1760 he became the first regular pastor of the Independent Presbyterian Church in Savannah, coming thither, according to the Church record, from Wando Neck, S. C. In 1775, at the provincial congress of 4 July, he was one of five delegates elected to represent Georgia in the Continental Congress, and was selected to draft a petition to the king regarding the "unhappy situation of affairs." In a letter of 3 Sept. 1775 to the Earl of Dartmouth, he denounced the suggestions made in England of arming the slaves to bring the Southern provinces to obedience. He took part in the adjourned session of the Continental Congress assembled 13 Sept. 1775. When he discovered the intention of the Congress to declare the independence of the United States, he revealed to Sir James Wright, royal governor of Georgia, the plans being made. One of the letters was seized, and Samuel Chase, of Maryland, referred to the fact on the floor of Congress. Zubly hastily withdrew, and in Georgia

openly made common cause with the Tories. In 1777 he was banished, and half of his estate seized. He remained in South Carolina until the royal government was re-established in 1779. He was an eloquent and learned preacher. Consult C. C. Jones, 'History of Georgia,' Vol. II. (1883).

Zuccarelli, dzoo-kā-rē'lē, or **Zuccherelli**, Francesco, Italian painter: b. Pitigliano, Tuscany, 1702; d. Florence 30 Dec. 1788. He studied painting at Florence and Rome, and after gaining some success in decorative landscape, worked for five years in London decorating the Opera-House and executing views of the Thames. He again came to England in 1752 and became a fashionable painter, patronized by the royal family, especially the Prince of Wales, and the aristocracy. He was one of the original members of the Royal Academy in 1768. In 1773 he returned to his native country. Numerous examples of his art are in Venice, the Palazzo Reale containing 21. A large number, too, are in Windsor Castle, and he is also represented in Glasgow, Edinburgh, Paris (Louvre), St. Petersburg (Hermitage), Milan (Brera), and other cities.

Zuccaro, dzook-kā'rō, or **Zuccherò**, Federico, Italian painter: b. Sant' Agnolo in Vado (Urbino) 1543; d. Ancona 1609. He was employed by Gregory XIII. to paint the vault of the Cappella Paolina in the Vatican, but having quarreled with some papal officials and painted a scurrilous picture he fled to France, and ultimately he reached England in 1574. There he painted portraits of Queen Elizabeth, the Earl of Leicester, and other distinguished persons (21 were exhibited in 1866), and afterward worked in Venice until he returned to Rome to complete his work in the Cappella Paolina. On the invitation of Philip II. he went to Madrid in 1586 to paint for the Escorial, and on his return to Rome he founded the Accademia San Luca, of which he became the first president. Many portraits of English personages in the Elizabethan era are wrongly ascribed to him, but some genuine works from his brush are extant. He was also something of an architect and sculptor. Among his easel-works are 'Deposition from the Cross' (Palazzo Borghese, Rome); 'Descent of Christ into Limbo' (Brera, Milan); 'Sir Walter Raleigh' (Kensington Gallery); 'The Resurrection' (Borghese).

Zucchi, dzook-kē, Antonio Pietro, Italian painter: b. Venice 1726; d. Rome 25 Dec. 1795. In 1754 he accompanied the English architect Robert Adam on his journeys in Italy and Dalmatia, and on Adam's invitation he went to England in 1766. He decorated the interiors of several of the mansions built or altered by Adam, such as Caen Wood (Hampstead), Luton House (Bedfordshire), Osterley House (near Brentford), and Sion House (Middlesex). In 1770 he was elected an associate of the recently established Royal Academy. He married Angelica Kauffmann (q.v.).

Zuchetto, tsük-kēt'tō, the skull cap of a Roman Catholic ecclesiastic covering the tonsure. That of a priest is black, of a bishop or monsignor purple, of a cardinal red, and of the pope white.

Zueblin, Charles, American sociologist: b. Pendleton, Ind., 4 May 1866. He was educated at the University of Chicago, Northwestern, and Yale; became an instructor in sociology at Chicago in 1892; was assistant professor in 1895; and associate professor from 1895 to 1902. In 1902 he was made professor. Among his writings is 'American Municipal Progress' (1902).

Zug, tsoug or zoog, Switzerland; (1) The capital of the canton of the same name, on the northeast shore of Lake Zug, 12 miles by rail northeast of Lucerne. It has splendid old mansions and strong watch-towers; several interesting churches; a Capuchin monastery and a convent; a cantonal government building in Renaissance style; a fine town-house in late Gothic style, with a museum of antiquities; an arsenal; manufactures of cottons, enamel-ware, metal goods, tobacco, cigars, soap, etc. In 1435, 1594, and 1887 portions of the town sank into the lake. Pop. about 7,000. (2) A central and the smallest undivided canton of Switzerland, bounded by Zurich, Schwyz, Lucerne, and Aargau. The surface, which is generally mountainous in the southeast and south, where the Rossberg occupies the frontier, slopes more or less gradually north and west till it becomes comparatively flat. The only lakes deserving the name are those of Zug and Egeri. The climate, rigorous in the mountainous districts, is mild on the lower southern slopes. The chief exports are cattle, fruits, cider, and "kirschwasser." Area, 92 square miles; pop. about 28,000. (3) A lake chiefly in the canton of Zug, but partly also in Lucerne and Schwyz. It is 1,340 feet above sea-level; 12 miles long north to south, and varies in breadth from three miles to one mile at the centre. The shores are low in all directions except the south and southeast. In the former direction the Righi, with Mount Pilatus towering behind it, and in the latter the Rufiberg or Rossberg, rise in abrupt and lofty precipices, presenting scenery of the grandest description. At the foot of the Rossberg the depth of the lake is not less than 1,200 feet. Steamers ply upon it, and the fishing, principally of pike and carp, is very productive.

Zuider-Zee, zī'dér zē, Dutch, zoi'dér-zā, or **South Sea** (as opposed to the North Sea), Netherlands, a large gulf penetrating deeply between the provinces of Friesland, Overijssel, Gelderland, Utrecht, and North Holland; about 80 miles long, 45 miles greatest breadth, but only 10 miles broad between Enkhuizen and Stavoren. The islands Texel, Vlieland, Terschelling, Ameland, etc., separate it from the North Sea, with which it communicates by various channels, the principal being Marsdiep, between the Helder and Texel, and the Vlie Strom between Vlieland and Terschelling. It contains the islands of Wieringen, Marken, Urk, and Schokland, and numerous sandbanks, especially in its northern portion; has on its shores numerous towns, and receives the waters of the Yssel, Vecht, Eem, Kuinder, etc., but is generally shallow, and only navigable by vessels of small draught. Oysters and plaice are plentiful. A great part of it is to be reclaimed at the expense of the Dutch government, by enclosing tracts along the margin with dams and pump-

ZULIA — ZUMARRAGA

ing out the water. This great undertaking when carried out will add a large area to the kingdom. The Zuider-Zee is of modern origin, having been formed chiefly since the 12th century by successive irruptions of the sea. In earlier times there were here only a lake and marshes.

Zulia, thoo'lē-ā, Venezuela, the most northwestern state of the republic, surrounding Lake Maracaibo (q.v.), bounded on the west by Colombia and on the east by Falcón. It was formerly united with Falcón, but is now politically independent. Lake Maracaibo is surrounded by low lands, but a great part of the rest of the province is mountainous. Agriculture is the chief industry; coffee, sugar, and cacao are raised. Area, 24,969 square miles; pop. 100,000.

Zuloaga, thoo-lō-l'gā, Félix, Mexican politician; president of the republic: b. Alamos, Chihuahua, 1814; d. Mexico 1876. Having entered the national guard as a lieutenant, he fought against the Yucatan secessionists in 1842-3, in 1843 rose to be lieutenant-colonel, and in preparation for the war with the United States directed the fortification of Monterey and Saltillo and of the southerly approaches of the capital. From 1848 to 1853 he was not in active service, but in 1853 was promoted colonel, and subsequently variously employed. On 17 Dec. 1857 he conspired against the Liberal government, and finally on 11 Jan. 1858 the brigade of which he was the commander declared Comonfort (see COMONFORT, YGNACIO) deposed and Zuloaga president. Zuloaga entered on the office 23 January, and the "War of Reform" began, the Liberals being under the leadership of Juárez. In December the garrison deposed Zuloaga, who finally resigned, and appointed as a substitute Gen. Miramon (q.v.), who assumed office 2 February. In 1860 Zuloaga published a manifesto proclaiming himself constitutional president, but subsequently he came to an agreement with Miramon. When the French invaded Mexico in 1862, he withdrew, but in 1864 he returned and submitted to the empire, though he took no further part in political affairs.

Zululand, zoo'loo-länd, South Africa, a country lying on the southeast coast of Africa, now a province of Natal, extending westward to the Transvaal Colony, and northward to Tongaland. Area, about 10,450 square miles. The principal rivers are the Tugela, on the Natal boundary; the Buffalo, which joins the Tugela on the left, about midway up the Natal frontier, and forms the remaining portion of the boundary between Natal and Zululand; and the Umvolosi, which flows into St. Lucia Bay. From the coast at St. Lucia a range of mountains called the Libombo range runs northward nearly parallel to the coast, separating the country into two regions. The coast region is unhealthy. The inland region is comparatively healthful, fertile, and capable of cultivation. Rich gold reefs have been found, and excellent coal exists. The coal is being worked and a railway has been constructed to the Tugela. The country, which since 1897 has been attached to the colony of Natal, is mainly inhabited by the Zulus, who have long been distinguished as the most warlike of the Kafir tribes. The country inhabited by the Zulus was formerly much more extensive. In the beginning of 1879 the Zulu king, Cetewayo or Ketch-

wayo, with a large army of fairly disciplined troops armed with rifles, came into collision with the British in South Africa. This was partly due to a long-standing dispute as to the claims of the Zulus to the Utrecht district in the southeastern angle of the Transvaal, partly to other causes, which at last induced Sir Bartle Frere, the governor-general of the British provinces in South Africa, to send an ultimatum to Cetewayo. To this no reply was sent, and war ensued. On 22 January a portion of a British column was attacked at a place called Isandula or Isandhiwana, about 10 miles from Rorke's Drift on the Buffalo, by 20,000 Zulus, and completely destroyed. As soon as possible after the news of the disaster reached England, strong reinforcements were sent out, and on 4 July following the Zulu army was totally defeated at Ulundi. On 28 August Cetewayo was captured. Meanwhile Sir Garnet Wolseley had arrived with supreme military and civil authority in this part of Africa, and the Zulu territory was parceled out by him among several chieftains who were placed under the paramount supremacy of the British government, and were not to be allowed to keep up standing armies, or to import firearms or ammunition. British residents were appointed, one in North and one in South Zululand. In 1883 Cetewayo was restored to a portion of his dominions, but was opposed by some of the chiefs. After severe fighting he placed himself in the hands of the British at Ekowe or Eahowe, where he died in 1884. Subsequently the Boers of the Transvaal made themselves masters of a considerable portion of the territory and incorporated it with their own republic. In 1885 the British assumed a protectorate over the coast of the country, and in 1887 annexed all the rest. A strip between Tongaland (now a British protectorate) and Swaziland also belongs to Zululand. Pop. about 210,000.

Zumalacarregui, thoo-mā'lā-kā'rā-gē, Tomas, Spanish soldier and Carlist leader: b. Ormaiztegui, province of Guipuzcoa, 1788; d. Segama, Navarre, 23 June 1835. He distinguished himself in the war for independence, subsequently entered the regular army, became a lieutenant-colonel in 1825, and later colonel. Ferdinand VII. made him governor of Ferrol, but Cea Bermudez, the prime-minister, removed him. Soon after the death of Ferdinand, he became the head of the Carlist bands in the Basque provinces and Navarre. With great ability he organized these troops into a really formidable force, and wielded them with remarkable success against such generals as Valdeas, Quesada, and Rodil. Finally, when the constitutional army had been signally outfought, Don Carlos, against Zumalacarregui's advice, determined to attack Bilbao. Zumalacarregui's plan was to march upon Madrid by way of Victoria and Burgos, and he regarded the siege of Bilbao as a waste of time. It was during the operations there that he received the wound from which he eventually died. He was the most able figure of the first Carlist war. Consult Henningsen, 'Twelve Months of Campaign with Zumala-Carregui' (1836).

Zumarraga, Juan de, hoo-ān' dā thoo-mār'-rā-ga, Spanish prelate in America: b. Durango (Biscay) 1468; d. Mexico 3 June 1548. He was for many years guardian of the convent

ZUMBO—ZURBARAN

of Abrojo in Spain, and in December 1527 was appointed bishop of the newly established see of Mexico. He greatly developed the Mexican missions, but directed considerable misguided zeal against Aztec manuscripts, which he gathered together all over Mexico and publicly burned. Only comparatively few escaped this destruction. His see was elevated to an archbishopric in 1548.

Zumbo, South Africa, a town of Portuguese East Africa, near the confluence of the Loangwa with the Zambesi, and on the frontier line of North Rhodesia, 450 miles from the mouth of the Zambesi. It marks the western point of the Portuguese territories on the Zambesi, and was formerly the seat of an important trade, but its trade has declined greatly and the town itself has decayed. The active development of this region will probably restore its importance.

Zumpt, tsoompt, August Wilhelm, German classical philologist: b. Königsberg 4 Dec. 1815; d. Berlin 23 April 1877. He was nephew of Karl (q.v.). He was a professor in the Friedrich-Wilhelms gymnasium of Berlin from 1851. Among his publications were editions of Rutilius Namatianus (1840) and the 'Monumentum Ancyranum' (1845); 'Commentationes Epigraphicae ad Antiquitates Romanas Pertinentes' (1850-4); and 'Studia Romana' (1859). The larger part of the last two volumes of the German edition of Ihne's 'History of Rome' is the work of Zumpt.

Zumpt, Karl Gottlob, German philologist: b. Berlin 20 March 1792; d. Karlsbad 25 June 1849. Educated at Heidelberg and Berlin, and in 1827 appointed professor at the latter, he did much effective work toward the improvement of instruction in the Latin language. Among his writings were a Latin grammar (1818; 13th ed. 1874); editions of Quintilian (1831); Curtius (1826; 1846), Cicero's orations against Verres (1831), and the 'De Officiis' (1838); and several treatises, such as 'Die Religion der Römer' (1845). An abbreviation of the grammar (1824) reached a 9th edition in 1866.

Zúñi (zoo'ñē) Mountains, a detached range in Valencia County, New Mexico. The general trend is from southeast to northwest; length, 45 miles. The mountains do not rise more than 10,000 feet above sea-level, and this is only from 3,000 to 4,000 feet above the surrounding plateau. The range is heavily timbered. It is of geological interest on account of its isolation and the simplicity of the stratification.

Zúñiga, thoon-yē'gā, Alvaro Manrique de, Spanish viceroy of Mexico: b. Seville about 1530; d. Madrid about 1600. He entered Mexico in October 1585 as viceroy, and his administration was, according to the historian, Juan de Torquemada, one of prudence and wisdom. A dispute with the audiencia of Guadalajara, however, on a point of jurisdiction, nearly precipitated civil war upon the colony. Philip II., on the basis of reports circulated by his foes, finally removed him in 1589, and directed Pedro Romano, the bishop of Tlaxcala, to investigate Zúñiga's government. Romano persecuted Zúñiga with great cruelty until 1596, when the latter sailed for Spain, where he was successful

in getting revoked the sentence of confiscation pronounced against him.

Zúñiga, Dionisio de, Central American missionary: b. Guatemala about 1550; d. Chiapa about 1620. He became a Dominican in Chiapa province, and for the greater part of his life was a missionary among the Quiche Indians. He wrote a grammar of the Quiche dialect, and prepared also in Quiche a volume of sermons and several religious treatises, besides translating Francisco Viana's works, originally written in the dialect of Vera Paz.

Zúñiga y Azevedo, é i-thā-vā'fhō, Gaspar de, Count of Montreux, Spanish viceroy in America: b. Andalusia about 1540; d. Lima, Peru, 10 Feb. 1606. He took vice-royal charge of Mexico 5 Nov. 1595, and in 1596 sent an expedition in command of Sebastian Vizcaino (q.v.) for the exploration and occupation of Lower California. Vizcaino was hampered by lack of provisions, and returned after accomplishing little. By royal order, he was again sent out by Zúñiga in 1602, exploring the coast of Upper California. In 1597 Zúñiga drove out William Park, an English pirate who had taken possession of Campeche. Among other expeditions organized by him was one commanded by De Oñate (see OÑATE, JUAN DE) and Zaldivar to take New Mexico. During his administration in Mexico he was a benefactor of the natives. In 1603 he became viceroy of Peru, though he did not enter Lima until 1604.

Zuns, Leopold, German Jewish scholar: b. Detmold, Germany, 10 Aug. 1794; d. Berlin 17 March 1886. He studied at the University to 1839 he was in Prague as preacher at the synagogue of Berlin; and in 1824-32 was editor of the 'Spenerische Zeitung.' From 1835 to 1839 he was in Prague as preacher at the synagogue there, but in 1839 returned to Berlin to become director of the normal seminary, holding that position until 1850. In 1845 he was made a member of the board of commissioners for the promotion of the educational interests of the Jews. He was the first to take up the scientific study of the Jews' rabbinical literature in his 'Etwas über die rabbinische Literatur,' published in 1818; and his 'Die gottesdienstlichen Vorträge der Juden' (1832) is considered the authoritative work on the biblical exegesis and the homiletics of the rabbinical writings. Among his other works are 'Die Namen der Juden' (1836); 'Die synagogale Poesie des Mittelalters'; and 'Litteraturgeschichte der synagogalen Poesie' (1865).

Zurbaran, thoor-bā-rān', Francisco, Spanish painter: b. Fuente de Cantos, Estremadura, 7 Nov. 1598; d. Seville 1662. He was educated in the school of Juan de Roelas in Seville, and early formed his style on that of Caravaggio. He is thence frequently known as the Spanish Caravaggio. He first brought himself into notice by a series of pictures for the chapel of St. Peter in the cathedral of Seville, illustrating the life of the apostle; and about 1625 he executed his celebrated picture of 'The Glory of St. Thomas Aquinas' (Seville Museum), which is esteemed his masterpiece, and is one of the finest works in Spain. As early as 1633 he signed himself painter to the king. In 1650 he executed for the palace of Buen Retiro the 'Labors of Hercules' in 10 pictures, now in the

ZURICH—ZUTPHEN

Madrid Museum. Though he painted several large compositions, he preferred small and simple ones, generally religious in subject. He especially made studies of the Spanish friar. His works are to be seen in some private collections, and in the galleries of St. Petersburg, Pesth, Munich, Paris, and London. Consult: Bermudez, 'Diccionario de los Mas Ilustres Profesores' (1800); and Lefort, 'La Peinture Espagnole' (1894).

Zurich, zoo'rĭk, Switzerland; (1) a city, capital of the canton of the same name, situated at the northeast extremity of the lake of the same name. It is divided by the Limmat into unequal parts, forming an upper and lower town, connected with their suburbs by several bridges. The streets in the oldest quarters are narrow, crooked, and dark, but have undergone considerable improvement. The principal buildings are the cathedral or Grosse Münster, on a hill near the right bank of the Limmat, a heavy massive structure in the Byzantine style; the Fraumünster, on the left bank of the river; St. Peter's Church, with a fine tower and clock; the town-house; the town library, containing 100,000 volumes; the museum, with a collection of home and foreign periodicals, and a rich library; the university; the new Swiss polytechnic school; the arsenal; the music buildings; the railway station; the theatre and the post-office. Two public promenades add to the attractions of the city, besides a botanical garden and many smaller parks and walks connected with a variety of institutions public and private. Manufactures of silk and cotton, including dyeing and calico-printing, are extensive; those of candles, soap, tobacco, paper, leather, and machinery are also considerable. Besides the university, founded in 1832, and having a professorial staff of 124, and over 700 students in theology, law, medicine, and philosophy, there are a polytechnic school, schools of medicine and of arts, secondary and elementary schools of all kinds, deaf and dumb and blind asylums, orphan and several other hospitals. Learned and other societies of various descriptions abound. Zurich is of great antiquity, and early became a Roman station. In 1219 it was declared a free imperial city. The preaching of Zwingli in the cathedral made it the centre of the Swiss Reformation. Here, in 1443, the Swiss defeated the Austrians; and here also, in 1799, the Russians were defeated by the French. The Treaty of Zurich, signed here 10 Nov. 1859 by the plenipotentiaries of France and Austria, closed the Franco-Italian war by Austria's abandonment of her right to Lombardy. Pop., including suburbs, about 155,000. (2) A northern canton bounded north by Schaffhausen and grand duchy of Baden, west by Aargau, south by Zug and Schwyz, and east by Saint Gall and Thurgau; area, 665 square miles. Though not properly mountainous, it has on its south and southeast frontiers several lofty ridges, remarkable for their parallelism. Except the Lägern and adjoining heights, they have their longer axis from southeast to northwest, and form a succession of terraces lowering gradually toward the north. The culminating points are the summits of the Hornli and the Schauenberg, both in the east. The general slope is toward the left bank of the Rhine, which drains part of it directly, and part

indirectly, by the Thur, Töss, Glatt, and Limmat. Of the lakes, about 40 in all, the most important are those of Zurich, Greiffen, Pfeffikon, Türlar, and Katzen. The climate is on the whole temperate, but mists are prevalent, particularly on the lower grounds. In some parts the prevailing rock is the Jura limestone, but a more recent formation, consisting chiefly of marl and sandstone in almost horizontal strata, is still more largely developed. One remarkable feature is the immense number and magnitude of the granite boulders which cover the surface. The minerals are few and of little value. The soil, with the exception of a few favored spots, is far from fertile, and hence, though the arable land is comparatively large and carefully cultivated, the corn produced falls short of the consumption. In some districts a wine of tolerable quality is produced. Wood seldom forms forests, but occupies many scattered patches and hedgerows. Game is scarce; fish almost superabundant. In no canton have manufactures made more progress. The great staples are silk and cotton goods. The inhabitants are almost all Protestants, and education is very generally diffused. Zurich was admitted into the Swiss Confederation in 1351, and re-admitted in 1450, after a 10-years' alliance with Austria. The government, formerly somewhat aristocratic, became decidedly democratic in 1831. A new democratic constitution was adopted in 1869. Zurich holds the first place in the Swiss Confederation. Pop. about 450,000. (3) One of the principal lakes of Switzerland, chiefly in the canton of Zurich, but partly also in Schwyz. It forms a long irregular curve, bending round from southeast to northwest, convex on the south, and concave on the north side; greatest length, about 27 miles; greatest breadth, not exceeding three miles; greatest depth, 600 feet. Its scenery is distinguished not so much for grandeur as for beauty. The mountains around, nowhere exceeding 1,700 feet above the lake, commence in wooded heights, and descend to the water's edge in gentle slopes, covered with vineyards, orchards, gardens, cultivated fields, and verdant meadows, and studded over with country-seats and smiling villages. A considerable traffic is carried on upon the lake by means of sailing vessels, and numbers of steamers. It is well supplied with fish. Its chief feeder is the Linth Canal, communicating with the Wallenstätter-see. It discharges itself at the town of Zurich by the Limmat.

Zurita, thoo-rē'tā, Geronimo, Spanish historian: b. Saragossa 4 Dec. 1512; d. 3 Nov. 1580. He was educated at Alcalá, in 1543 was sent to Germany on a diplomatic mission to Charles V., and subsequently was made councillor of state and secretary to Philip II. Appointed chronicler of Aragon, he traveled in quest of data through Spain, Sicily, and Italy, and finally in 1562-80 published in six volumes his 'Anales de la Corona de Aragon,' continued by Argensola and Blasco-Lanuza (1622). He also made important corrections in, and additions to, Lopez de Ayala's (see AYALA, LOPEZ DE) 'Crónicas de los Reyes de Castilla.' For a biographical sketch and some correspondence, consult Dormer, 'Progresos de la Historia en Aragon' (1680).

Zütphen, züt'fēn, Netherlands, a former fortified town in the province of Gelderland, 27

miles northeast of Arnhem, on the right bank of the river Yssel, where it is joined by the Berkel. Its chief edifice is the 12th century church of Saint Walpurgis. The town was at one time a member of the Hanseatic League, and had a considerable foreign trade, which has ceased. It still has an active home trade, more especially in sending timber, both rough and prepared, down the Yssel. Pop. about 20,000.

Zuyder Zee. See *Zuider-Zee*.

Zweibrücken, tsvi'brük-én (Latin, *Bipontium*; French, *Deux-Ponts*, 'Two Bridges'), Germany, a town of Bavaria, on the Schwarzbach, 34 miles west by north of Landau. It was the capital of a mediæval duchy until the end of the 18th century. It is well built, and has Protestant and Roman Catholic churches and a synagogue; gymnasium, real-school, and several other schools; courts and public offices occupying the former ducal palace; an orphanage and hospitals; manufactures of silk plush, machinery, chicory, tacks, chains, leather, etc., and a trade in corn and cattle. The edition of the classics known by the name of 'Bipont' was published here in 1779 and subsequent years. Pop. about 15,000.

Zwickau, tsvik'ow, Germany, a town of Saxony, on the left bank of the Mulde, 60 miles by rail west-southwest of Dresden. It has several interesting churches, among them two ancient Gothic ones recently restored, one of them dating from the 12th century; a gymnasium with a library; and an old castle converted into a penitentiary. The chief source of its wealth is the rich coal beds in the vicinity, employing 8,000 miners, and yielding annually \$5,000,000 worth of coal. There are also manufactures of linen and cotton goods, dyes, and chemical products, numerous tanneries, dye-works, bleach-works, oil, saw, and other mills, and a considerable transit and general trade. See ANABAPTISTS for the "Prophets of Zwickau." Pop. about 58,000.

Zwinger, tsving'er, Theodor, Swiss scholar. b. Basel 2^d Aug. 1533; d. there 10 March 1588. He studied at Basel, and after a course in medicine at Padua, became a member of the Basel medical faculty. He lectured there on Greek in 1565-71 and subsequently on ethics, and from 1580 was professor of the theory of medicine. Zwinger was a type of the universal scholarship of that time; and wrote a 'Theatrum Viarum Humanarum,' a kind of general encyclopædia, then regarded as a marvel, but now having only a bibliographical interest. His 'Methodus Apodemica' contains material valuable for local history. Consult 'Athenæ Rauricæ' (1778), which contains a list of his writings.

Zwinger, The, a public building in Dresden, containing a valuable collection of works of art and scientific treasures. The word Zwinger is a general name for a prison, or any confined place.

Zwingli, zwing'le, Ger. tsving'le, or *Zwinglius Ulrich*, a celebrated Swiss reformer, was a contemporary of Luther (q.v.), and was born at Wildhaus, canton of Saint Gall, on 1 Jan. 1484. Ulrich was the third of eight sons of the bailiff of that place. He studied

at an early age in Basel and Bern, and continued his studies in Vienna, where he occupied himself with philosophy, and again in Basel, where he devoted his attention to theology, under the direction of Wyttenbach. In 1506 Zwingli became parish priest at Glarus, and here employed his time, as Luther had done in the Augustine monastery at Erfurt, in the diligent reading of the Holy Scriptures. He copied the epistles of Saint Paul in the original Greek, and even learned them by heart—an acquisition which afterward proved of great service to him in his public discussions. He accompanied the forces of Glarus during the campaigns of 1512, 1513, and 1515, in Lombardy, in the cause of the pope against the French, in the capacity of chaplain, and was rewarded for this service by the grant of a pension from the pope. In 1516 he became preacher in the convent of Einsiedeln, then a celebrated place of pilgrimage. Here he began to make known publicly his ideas of reform, preaching against the pilgrimage of Einsiedeln, which he termed an abuse and a corruption of the doctrine of the Christian Church, and calling upon the bishops of Sion and Constance to promote a reformation of religious doctrines, upon those points in which Zwingli considered that the Church had departed from the primitive teaching. Up to this time, however, his ideas of innovation excited no rebuke upon the part of the authorities, and he was, not long after, invited to Zurich, and entered on his office of preacher in the cathedral 1 Jan. 1519, with a discourse in which he declared himself for the use of the simple Scriptures without regard to the prescribed texts and lessons. At Zurich Zwingli delivered a series of sermons on the Holy Scriptures; and these discourses in which he inveighed against what he declared to be the errors and superstition of the times, laid the foundation for his future work of reformation. The occasion which launched him on his career was similar to that which had aroused Luther. In 1518 Bernadin Samson, a Franciscan monk of Milan, appeared in Switzerland to preach the indulgence proclaimed by Leo X. to all who should subscribe alms to the building of St. Peter's Church at Rome. Zwingli, who was then preaching at Einsiedeln, opposed him there, and afterward in Zurich, with all the power of his eloquence, and brought the indulgences into so much odium that Samson was not even permitted to enter Zurich; and the Council of Zurich finally obtained from the Papal Nuncio the recall of Samson to render an account of his mission at Rome. From this time Zwingli gradually went further in his plans, supported by the Zurichers. In Zurich his innovations were so far promoted by the government that in 1520 a decree was issued ordering that the Holy Scriptures should be taught "without human additions." In 1522 the reformation was extended to external ceremonies. In this year Zwingli was forbidden to preach by the bishop of Constance. In it also he wrote his first work against the fasts of the Church and began the study of Hebrew. In 1523 the government in Zurich invited all theologians to a public conference in Zurich, to convict, if possible, Zwingli of an error in doctrine. About 600 persons, clergy and laymen, were present at this disputation. Zwingli exhibited his opinions in the form of 67 propositions, which were to form

ZWOLLE—ZYMOTIC DISEASE

the subject of discussion. The celebrated John Faber, the vicar-general of the bishop of Constance, refused to discuss any of Zwingli's propositions save the last one, which denied the supreme authority of the Church, whereupon the Council of Zurich decreed that Zwingli had not been convicted of error or heresy, and "might continue to freely announce the holy gospel and the Word of God according to the new order." In a second dispute Zwingli urged his objections to images and the mass, and the former were soon afterward removed from the churches by order of the Council and the latter abolished. In 1524 Zwingli married Anna Reinhard, a widow, and the next year published his commentary on "True and False Religion." The Reformation in Switzerland was now fixed upon a firm base; and Zwingli continued the work with undiminished zeal, warmly supported by the cantons which espoused the Protestant cause. The religious orders were suppressed, and all questions of marriage were placed under the jurisdiction of the civil tribunals, as well as the administration of the Church revenues. In general, Zwingli agreed in his opinions with the German reformers; like them he assumed the Bible as the only rule of faith, rejected the Papacy, attacked the authority of the priesthood, and declared that his object was to restore the Church to the simplicity of primitive times. His views differed on some points from those of Luther, particularly in regard to the real presence, and on some less important matters relative to the liturgy. In order to remove this wall of partition from between the two parties which adopted the new doctrines, a meeting between the Saxon and Swiss reformers was held at Marburg (1-3 Oct. 1529) at the suggestion of Philip, the Landgrave of Hesse. The former were represented by Luther and Melancthon, the latter by Zwingli and Oecolampadius. Although a complete union was not effected, yet a convention was agreed upon, the first 13 articles of which, containing the most important matters of religious faith, were recognized by both parties; and the 14th declared that, though they could not agree as to the real presence of Christ in the eucharist, they would behave reciprocally in the spirit of Christian charity. In 1531 an open war broke out between Zurich on the one side and the Catholic cantons of Lucerne, Schwyz, Uri, Unterwalden, and Zug on the other; and Zwingli was commanded to take the field, bearing the banner of the canton, which it had been usual for an ecclesiastic to support. A battle ensued at Cappel, on the 11th of October. But the enemy were more than twice as strong as the Zürichers, and under better officers; the latter were therefore defeated, and Zwingli was among the slain. The Reformed Church in Switzerland afterward received from the hands of Calvin (q.v.) its present organization. The collected works of Zwingli were published at Zurich in 1545. A complete collection of Zwingli's writings was also published at Zu-

rich in eight volumes in 1828. E. Zeller has attempted to deduce Zwingli's doctrines from his writings, 'Das theologische System Zwinglis dargestellt' (Tübingen 1853). There are numerous biographies of this reformer, for example, 'Huldreich Zwingli, sein Leben und Wirken' (1895-7) by Stähelin. Consult also Janssen, 'History of the German People' (1903).

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Zwolle, zwöl'lē, Netherlands, capital of the province of Overijssel on the Zwart Water, 25 miles north of Zutphen. Formerly it was a member of the Hanseatic League and was a strong fortress with 11 bastions and three forts. It is a well-built city, with handsome boulevards on the site of its ancient ramparts, and three fine suburbs. Its corn market is one of the best in Holland. Its chief buildings are Saint Michael's Church, a large and splendid building with a famous organ, the government buildings with the provincial archives, the town-hall, and the courts of justice. The town has a Latin school, a school of navigation, an industrial school, a public library with rare works on geography and local history, a museum of natural history, a theatre, etc. Zwolle has communication with the sea by means of the Willemvaart Canal. It manufactures oil, spirits, iron goods, and linens, carries on shipbuilding, and a trade in corn and cattle. In a monastery in the neighborhood Thomas à Kempis lived and died.

Zylonite, **Xylonite**, same as celluloid. See CELLULOID.

Zylonite, a material made by treating cellulose or vegetable fibre with nitric and sulphuric acids, dissolving the resulting pulp in camphor, and then drying it. In its liquid state, collodion, it was used in surgical operations as early as 1848; in 1855 zylonite was manufactured by Alexander Parkes of Birmingham, England, and put on the market as parkesine. About the same time several factories for the manufacture of zylonite were established in France and Germany, England, and the United States. In 1869 celluloid (q.v.), a kind of zylonite, was first manufactured, and has entirely superseded all other forms of zylonite.

Zymotic Disease, any disease caused and continued by a living germ introduced from without into the body and there multiplied. The term was formerly applied to epidemic and endemic contagious diseases because they were supposed to be produced by some morbid principle acting on the system like a ferment (Greek ζῦμα). The chief of such diseases include measles, scarlet fever, smallpox, typhus, diphtheria, whooping-cough, croup, and erysipelas (q.v.). With the development of present theories and scientific knowledge of infectious disease, the term zymotic has been almost abandoned. See BACTERIOLOGY; DISEASES, General Theory of; MALARIA; NEBULOLOGY.

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